UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. 40, No. 4 JULY-AUGUST, 1914 Whole No. 152

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE BATTLE OF THE SEA OF JAPAN

THE OFFICIAL VERSION OF THE JAPANESE GENERAL STAFF

Translated by LIEUTENANT W. T. HOADLEY, U. S. M. C.

THE DISCOVERY OF THE RUSSIAN FLEET

The commander-in-chief, Admiral Togo, had collected his units in the Korean Straits, and was watching the movements of the reenforcing fleet of Russia. They left Madagascar in the middle part of March, and, after a stay on the coast of Annam, gradually cruised north. Togo, making battle preparations since the middle part of May, awaited this fleet, which at last, on the dawn of May 27, arrived. At this time, the greater part of the first and second divisions were at Katoku Channel, on the southern coast of Korea. A greater part of the third fleet were at Ozaki Bay. The third division was cruising northwest of Shirase Island. The converted cruisers *America Maru, Sado Maru, Shinano Maru,* and the *Manshu Maru* were distributed west of Shirase. The *Akitsushima* and the *Izumi* were to the eastward, close at hand to the above four ships. At 2.45 a. m. the *Shinano Maru,* while cruising northeast, and at a point 40 sea miles north and ½ sea mile west of Shirase, discovered to port, lights of a steamer cruising to the eastward. Drawing near, she made out three lights (white, red, and white) on the mizzen mast. As the moon was in the eastern sky, and as the *Shinano Maru* was to the eastward, it was impossible to distinguish the stranger. Then the *Shinano Maru,* increasing her speed, crossed astern of this ship, to her

port side. At 4.30 a. m., drawing closer, she found her to be a ship of three masts and two stacks, which, from her appearance, seemed to be the Russian converted cruiser *Dneiper*, but on closer examination, found she had no battery. While the captain of the *Shinano Maru* was conjecturing as to whether she was a hospital ship or not, he perceived that she was making signals with electric lights to him, evidently taking his ship for a companion ship. He at once knew that there must be other ships at hand, but as it was not yet dawn, and as the mist hung heavy, he was unable to make out any other ships. Deciding to make a closer examination of the stranger, he drew nearer, and while doing so, discovered several trails of smoke, then the outline of a number of ships, heading northeast, at a distance of less than 1500 meters and on the port bow. He at once realized that his ship was in the center of the enemy's fleet. He quickly changed course, and at the same time reported the appearance of the enemy. The time was just 4.45 a. m., May 27. He also reported that the enemy was on a course about ENE., which would take them through the eastern channel of Tsushima. On account of the mist, at 5.20 a. m. he lost sight of the enemy, and at 6.05 a. m. again picked them up, and kept in close contact until he changed course to avoid a destroyer, at which time he discovered smoke to the southward. Changing course, he proceeded in that direction. The *Izumi* receiving the *Shinano Maru's* report, changed course and went in search of them. At 6.45 a. m. she picked them up at a point Lat. 33° 30′ N., Long. 128° 50′ E. From this time the *Izumi* relieved the *Shinano Maru*, keeping in contact with them on a parallel course, at a distance of five sea miles to the southward of them, and reported the number and the movements of the ships. Admiral Kataoka, with the third fleet, was at Ozaki Bay, and when he received the report, transmitted it to the commander-in-chief, Admiral Togo. At the same time he ordered his command to prepare for action. The sixth division (*Suma* and *Chiyoda*—the *Akitsushima* and *Izumo* were absent), and the tenth and fifteenth torpedo-boat flotillas, under command of the division commander, Rear Admiral Togo,[1] got under way at 5.44 a. m. Admiral Kataoka, with the fifth division (despatch boat *Yaeyama* added), the eleventh and twentieth torpedo flotillas, the seven-

[1] Admiral Togo Commander-in-Chief; Rear Admiral Togo Commander of sixth division.

teenth and eighteenth torpedo flotillas (attached to the Takeshiki Naval Station) and the *Shirataka*, of the sixteenth flotilla, followed, and attempting to ascertain the course of the enemy, cruised to the southward of Kinzaki. Admiral Kataoka then ordered the division commander, Admiral Yamada, with the seventh division, to proceed to that cape, and if possible, to ascertain the strength of the enemy. At 9.55 a. m., when 7½ sea miles S. by E. of Kinzaki, he discovered the enemy's fleet to the southward. Admiral Kataoka ordered the torpedo craft and the *Yaeyama* to take shelter for a while in the vicinity of this cape until he found out the enemy's movements. At 10 a. m. he ordered the fifth division to cruise northeast to a position four or five sea miles on the port bow of the enemy, and keep in close contact. Then he ordered the *Suma*, *Chiyoda*, the *Akitsushima* of the sixth division, the *Yaeyama*, the tenth, fifteenth, and five other flotillas to join. Up to this time the enemy had often changed course and there was some apprehension that they would be lost from view. At ten minutes past noon Admiral Kataoka, detaching the sixth division, ordered them to take position ahead of the enemy and keep in contact. The conditions were constantly reported to the commander-in-chief, Admiral Togo. The third division (*Kasagi*, flagship of Admiral Dewa, *Chitose*, *Niitaka*, and the *Otowa*) by means of the report of the *Shinano Maru*, knew of the enemy's appearance. In order to get in contact with them, Admiral Dewa, increasing speed, cruised to the southeastward at 5.50 a. m., discovered a hospital ship of the enemy, and from that time cruised to the southward. At 7 a. m., from the report of the *Izumi*, he knew that the enemy's ships were to the northward. He cruised with great speed for more than three hours to the northeastward, and at last, about 15 sea miles south of Kinzaki, picked them up in the mist. Keeping them on his starboard beam at a distance of about four or five sea miles he cruised along. At 11.42 a. m., he exchanged fire with the enemy for a while, then took a position ahead of the enemy.

GENERAL ACCOUNT OF THE BATTLE

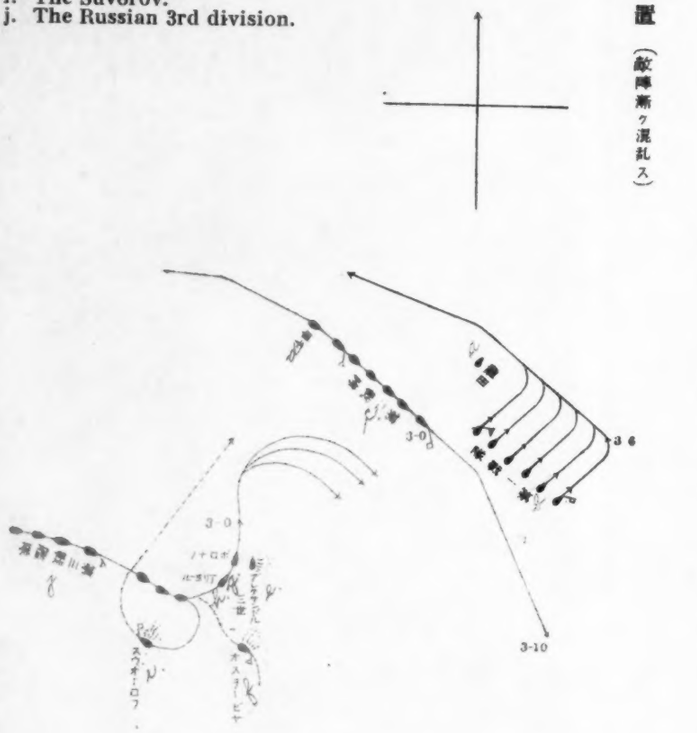
On this day the commander-in-chief, Togo, was on his flagship, the *Mikasa*, in Chinkai Bay; the first, second and fourth divisions, etc., were in Katoku Channel. At 5.05 a. m., the commander of the second fleet, when he received the report, ordered his command to get under way. The first division (despatch boat *Tatsuda* added),

the second division (despatch boat *Chihaya* added, the *Asama* detained, joining at 10 a. m.), the fourth division, the first, second, third and fifth destroyer flotillas, as well as the ninth, fourteenth and nineteenth torpedo flotillas, one after another got under way. (The fourth destroyer flotilla, intending to join the third division, was in Ozaki Bay on this date.) The commander-in-chief, Admiral Togo, sent a message from Chinkai Bay to the Imperial headquarters, telling of the appearance of the enemy's fleet, and his intention to engage and destroy them. The weather this day was fine, but the sea was high. At 6.34 a. m., leading in a grand array of more than forty-six ships, he left for the scene of action. From reports received often, he knew the strength, formation, and course of the enemy's fleet. He determined to attack in the vicinity of Okinoshima. From the channel, taking a suitable course, he headed for his objective. At this time the surface of the sea was enveloped in mist and the range of vision did not exceed 4 or 5 sea miles. A WSW. wind with a strength of 4 or 5 was blowing. The sea being high, the cruising of the torpedo craft was difficult. Therefore the commander-in-chief, Admiral Togo, ordered the torpedo-boat flotillas to take shelter in Miura Bay, and to join the fleet when the opportunity arose. Continuing on his course with the destroyers and larger ships, he arrived north of Okinoshima at noon. From the reports of Admiral Kataoka he knew that the enemy's fleet was cruising NE. by E., about 12 sea miles north of Wakamiya Island, off Iki Province. Changing course often, he picked up the third division at 1.15 p. m. bearing SW. by W., and saw the fifth and sixth divisions to the westward. At 1.39 p. m. he was able to make out the enemy's fleet at a great distance to the southwestward. Hereupon orders were given to open the engagement. In order to attack the enemy's fleet on the left flank, at 1.40 p. m. he ordered the first and second divisions, constituting the main strength, to change course to NW. by N. On the forward bridge of the *Mikasa*, the commander-in-chief, Admiral Togo, surrounded by his staff, watched the enemy with field glasses. The enemy at that time was about seven sea miles southwest of the *Mikasa*. The starboard column of the enemy consisted of four battleships of the *Borodino* type. The division, consisting of the *Oslabaya, Sissoi Veliky, Navarin,* and *Admiral Nakhimov,* formed the port column, and was followed by the *Nikolai I,* and three coast-defence battleships. Two ships, the

4. The position at 3.00 P. M., the enemy's formation in a confused state.

a. The Tatsuda.
b. The 1st division.
c. The 2nd division.
d. The Chihaya.
e. The Alexander the III.
f. The Oslabaya.
g. The Borodino.
h. The Orel.
i. The Suvorov.
j. The Russian 3rd division.

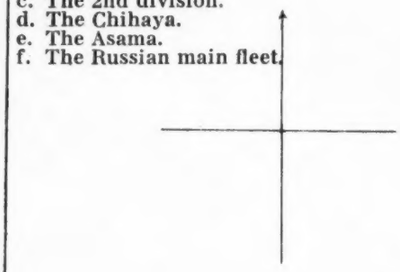
(4) 午後三時ノ位置 (敵陣漸ク混乱ス)

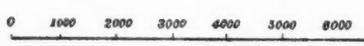


3. The position at the time the battle w
at its height, 2.40 P. M., May 27th.

NOTE:—The firing was stopped on
count of the smoke enveloping
enemy's ships.

a. The Tatsuda.
b. The 1st division.
c. The 2nd division.
d. The Chihaya.
e. The Asama.
f. The Russian main fleet.



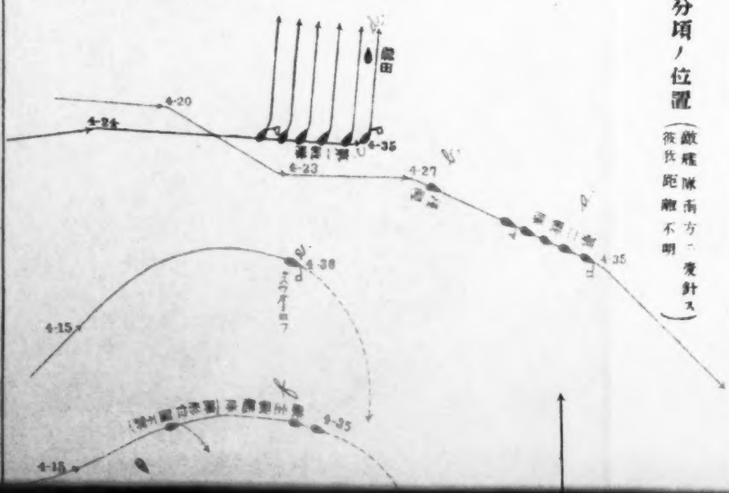


8. The position about 4.35 P. M.

NOTE:—The enemy changed course to the south, range unknown.

a. The 2nd division.
b. The Asama.
c. The 1st division.
d. The Tatsuda.
e. The Suvorov.
f. The enemy's main fleet (formation and position not clear).
g. The Russian 3rd division.

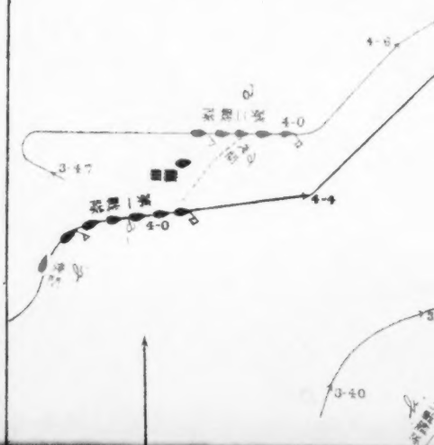
(8) 午後四時三十五分頃ノ位置 (敵艦隊南方ニ変針ス 彼我距離不明)



7. The position at 4.00 P. M. at the ope
second phase.

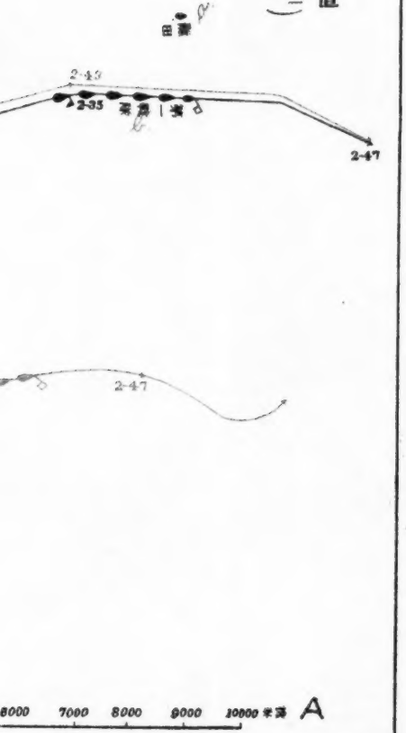
The enemy's position and formatio

a. The 2nd division.
b. The Asama.
c. The Tatsuda.
d. The 1st division.
e. The Asama.
f. The Suvorov.
g. The Russian 1st division.
h. The Russian 2nd division.
i. The Russian 3rd division.

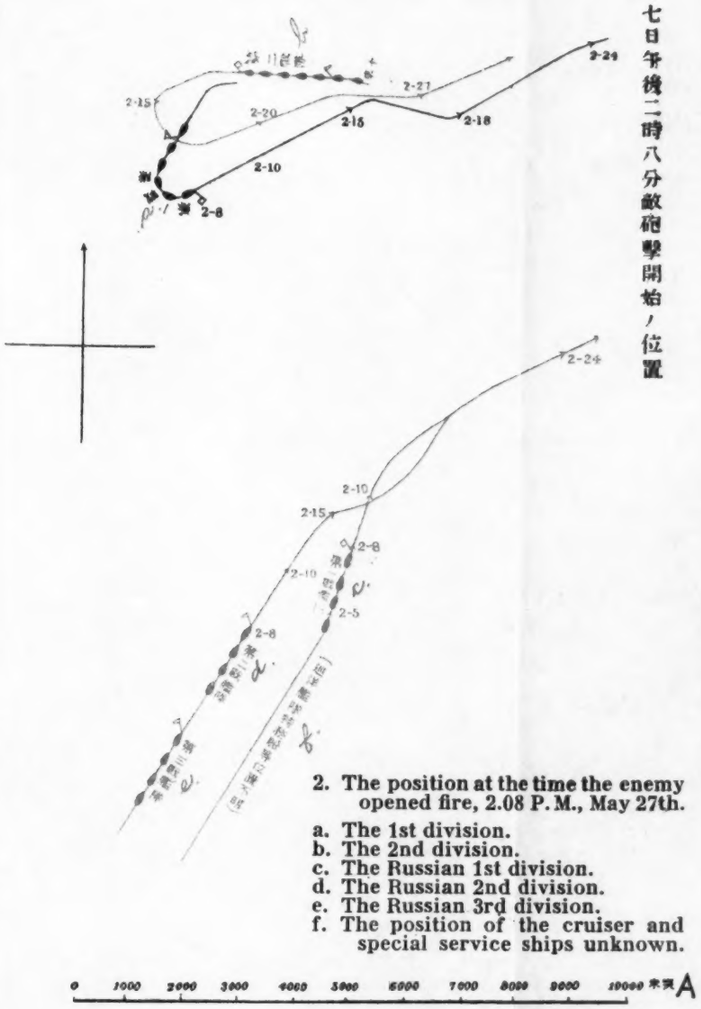


tle was
th.
on ac-
ng the

(3)
午後二時四十分頃酣戦時ノ位置



(2)
二十七日午後二時八分敵砲撃開始ノ位置



2. The position at the time the enemy opened fire, 2.08 P. M., May 27th.

a. The 1st division.
b. The 2nd division.
c. The Russian 1st division.
d. The Russian 2nd division.
e. The Russian 3rd division.
f. The position of the cruiser and special service ships unknown.

1. The position at 1.55 P. M., May 27th.

a. The 1st division and the Tatsuda.
b. The 2nd division.
c. The 2nd destroyer flotilla.
d. The Chihaya.
e. The 5th destroyer flotilla.
f. The 1st and 3rd destroyer flotilla.
g. The 3rd division.
h. The 4th destroyer flotilla.
i. The 5th division.
j. The 6th division.
k. The Yaeyama.
l. The 15th torpedo flotilla.
m. The 10th torpedo flotilla.
n. The 11th torpedo flotilla.
o. The 20th torpedo flotilla.
p. The 17th torpedo flotilla.
q. The 18th torpedo flotilla.
r. The Zhemtshug. The Izumrud and the 1st destroyer flotilla (Russian).
s. The 1st division (Russian).
t. The 2nd division.
u. The 3rd division.
v. The 1st cruiser division and the 2d destroyer flotilla (Russian).
w. The cruiser and special service ships division.

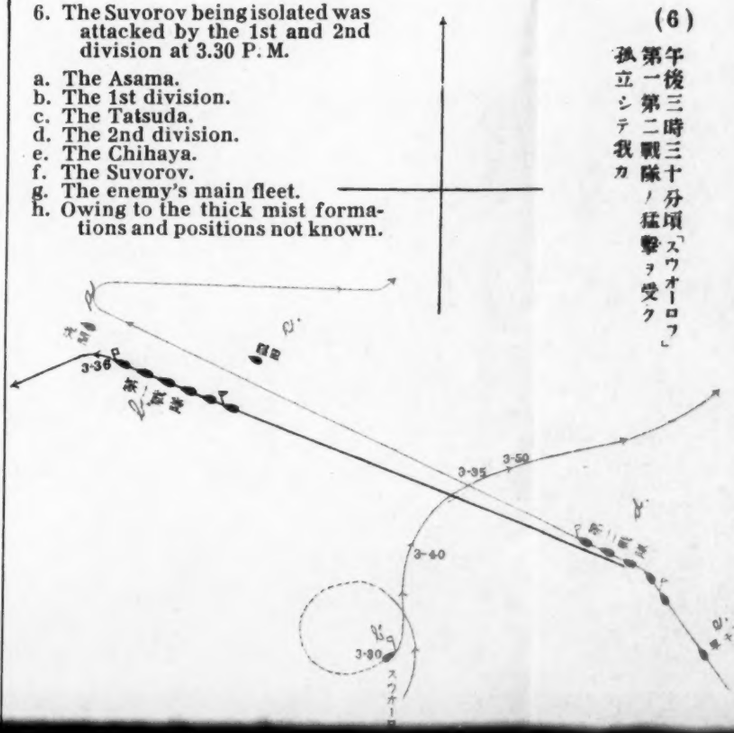
opening of the
ation not clear.

(7)
午後四時頃第二次戦闘開始ノ位置

6. The Suvorov being isolated was attacked by the 1st and 2nd division at 3.30 P. M.

a. The Asama.
b. The 1st division.
c. The Tatsuda.
d. The 2nd division.
e. The Chihaya.
f. The Suvorov.
g. The enemy's main fleet.
h. Owing to the thick mist formations and positions not known.

(6)
午後三時三十分頃「スウオーロフ」第一第二戦隊ノ猛撃ヲ受ク孤立シテ我カ



5. The position about 3.15 P. M. when the Oslabaya sunk.

a. The Tatsuda.
b. The Asama.
c. The 1st division.
d. The 2nd division.
e. The Suvorov.
f. The Russian 3rd division.
g. The Oslabaya sinks.

(4)

午後三時ノ位置

3. The position at the time the battle was at its height, 2.40 P. M., May 27th.

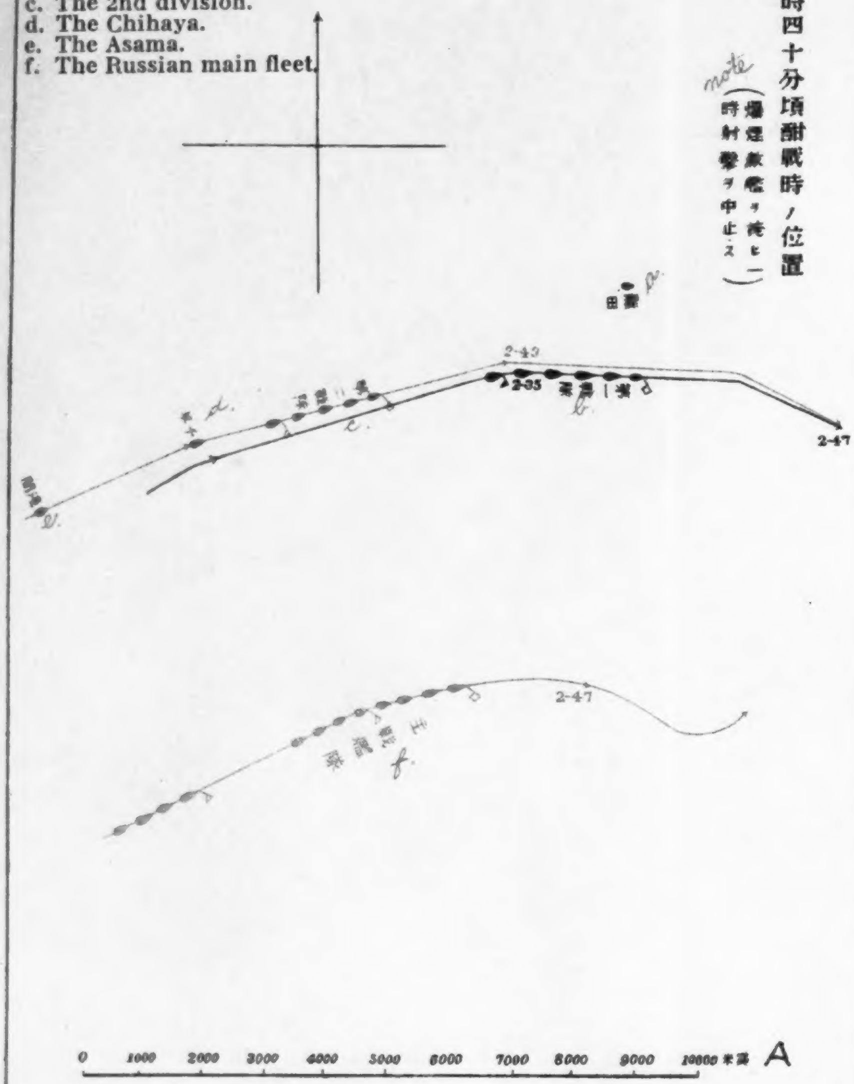
NOTE:—The firing was stopped on account of the smoke enveloping the enemy's ships.

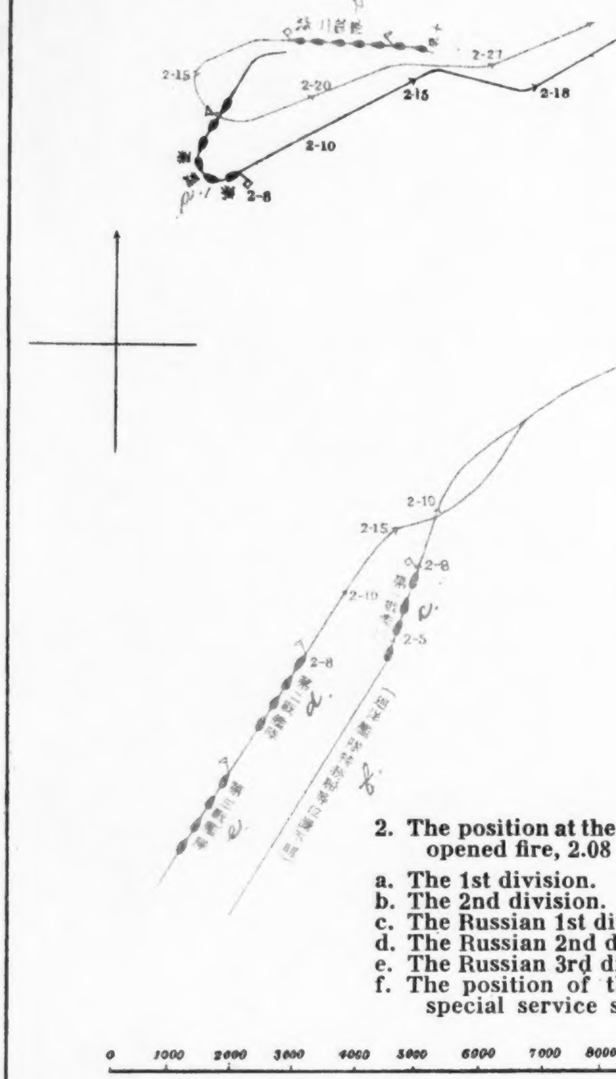
a. The Tatsuda.
b. The 1st division.
c. The 2nd division.
d. The Chihaya.
e. The Asama.
f. The Russian main fleet.

(3)

午後二時四十分頃酣戰時ノ位置

(爆煙敵艦ヲ掩ヒ一時射撃ヲ中止ス)





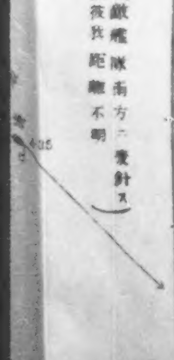
2. The position at the t
opened fire, 2.08 P

a. The 1st division.
b. The 2nd division.
c. The Russian 1st div
d. The Russian 2nd di
e. The Russian 3rd div
f. The position of th
special service sh

(8)

午後四時三十五分頃ノ位置

(敵艦隊南方ニ變針ス 我ト距離不明)



7. The position at 4.00 P. M. at the opening of the second phase.

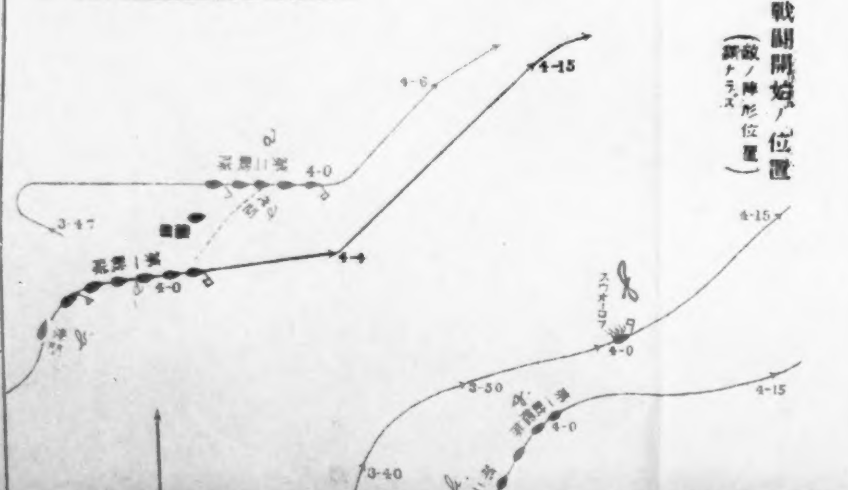
The enemy's position and formation not clear.

a. The 2nd division.
b. The Asama.
c. The Tatsuda.
d. The 1st division.
e. The Asama.
f. The Suvorov.
g. The Russian 1st division.
h. The Russian 2nd division.
i. The Russian 3rd division.

(7)

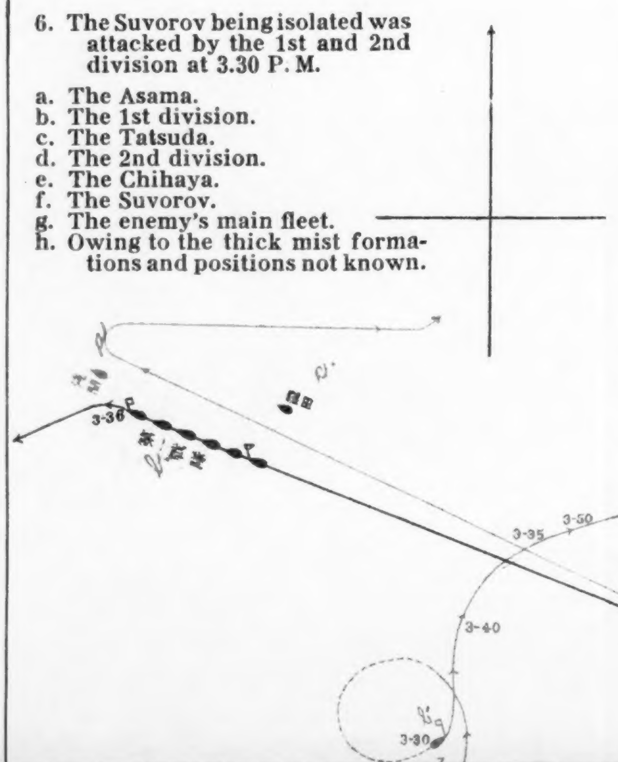
午後四時頃第二次戰鬪開始ノ位置

(敵ノ陣形位置詳ナラズ)



6. The Suvorov being isolated was attacked by the 1st and 2nd division at 3.30 P. M.

a. The Asama.
b. The 1st division.
c. The Tatsuda.
d. The 2nd division.
e. The Chihaya.
f. The Suvorov.
g. The enemy's main fleet.
h. Owing to the thick mist formations and positions not known.



(2)
二十七日午後二時八分敵砲撃開始ノ位置

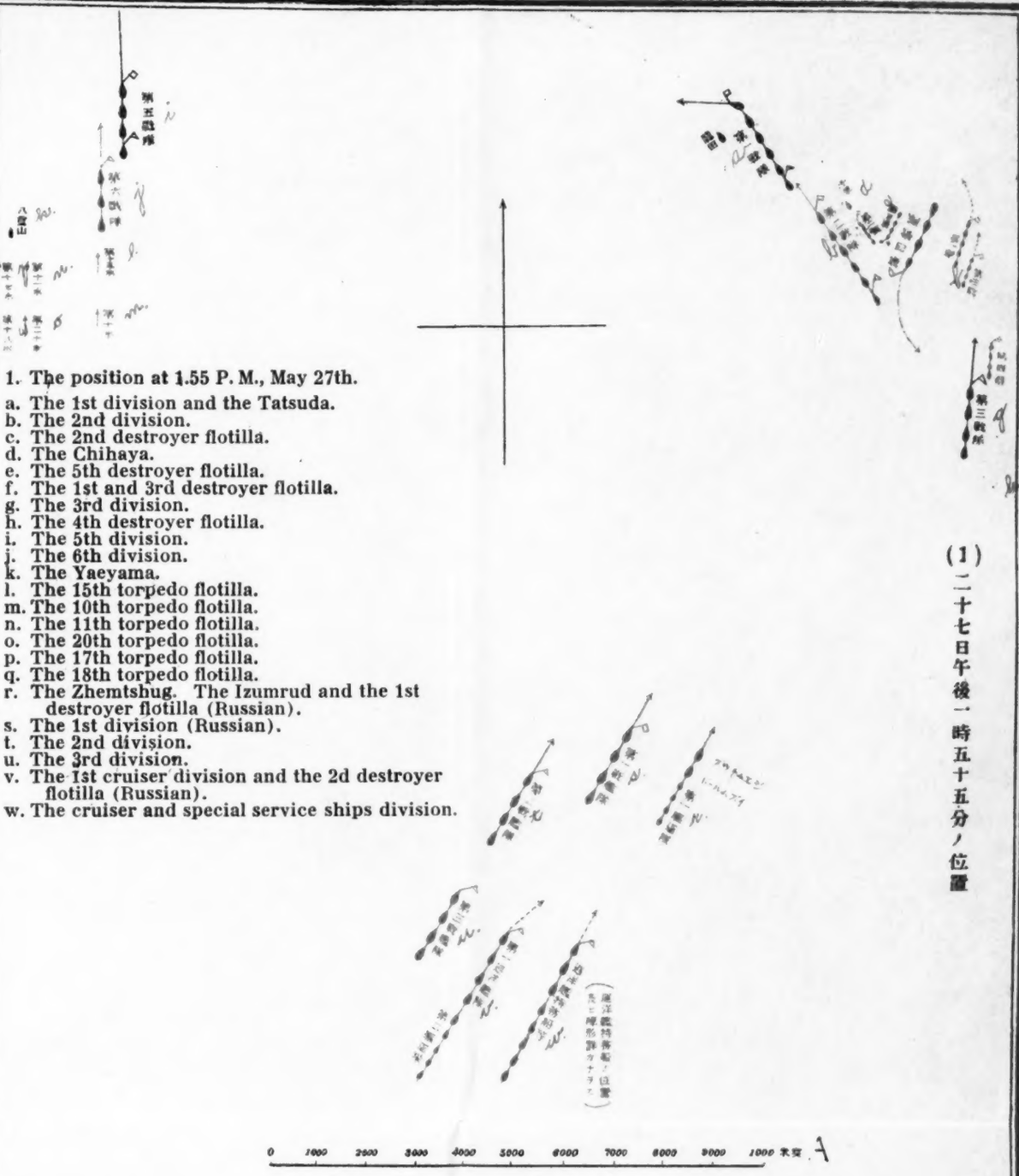
the time the enemy
.08 P. M., May 27th.
n.
on.
t division.
d division.
d division.
f the cruiser and
ce ships unknown.

8000 9000 10000 米突 A

(6)
午後三時三十分頃「スウオーロフ」第一第二戦隊ノ猛撃ヲ受ク孤立シテ我カ

1. The position at 1.55 P. M., May 27th.

a. The 1st division and the Tatsuda.
b. The 2nd division.
c. The 2nd destroyer flotilla.
d. The Chihaya.
e. The 5th destroyer flotilla.
f. The 1st and 3rd destroyer flotilla.
g. The 3rd division.
h. The 4th destroyer flotilla.
i. The 5th division.
j. The 6th division.
k. The Yaeyama.
l. The 15th torpedo flotilla.
m. The 10th torpedo flotilla.
n. The 11th torpedo flotilla.
o. The 20th torpedo flotilla.
p. The 17th torpedo flotilla.
q. The 18th torpedo flotilla.
r. The Zhemtshug. The Izumrud and the 1st destroyer flotilla (Russian).
s. The 1st division (Russian).
t. The 2nd division.
u. The 3rd division.
v. The 1st cruiser division and the 2d destroyer flotilla (Russian).
w. The cruiser and special service ships division.

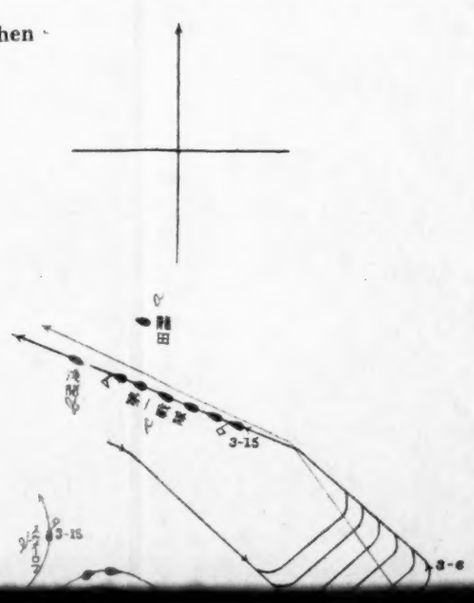


0 1000 2500 3000 4000 5000 6000 7000 8000 9000 10000 米突 A

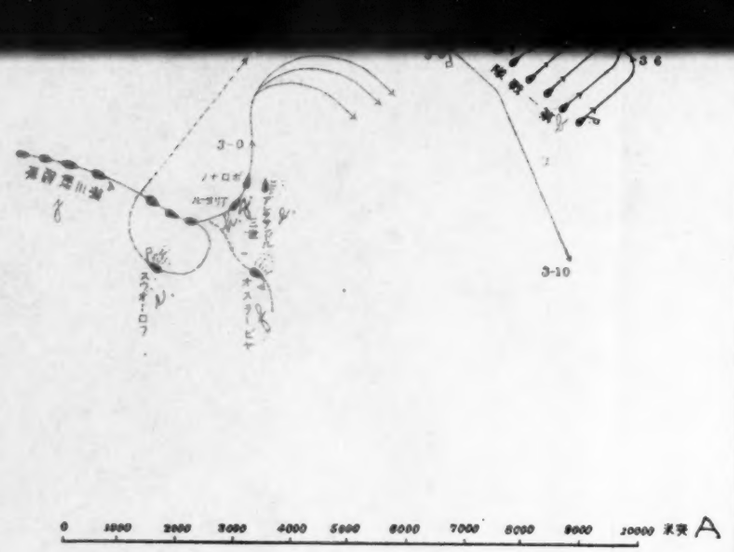
(1)
二十七日午後一時五十五分ノ位置

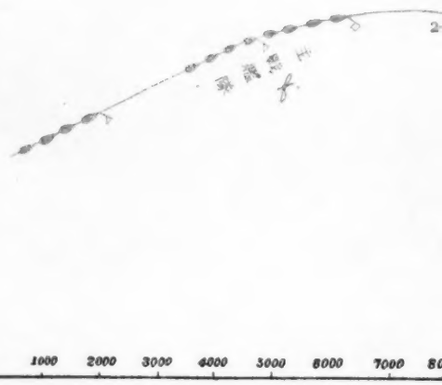
5. The position about 3.15 P. M. when the Oslabaya sunk.

a. The Tatsuda.
b. The Asama.
c. The 1st division.
d. The 2nd division.
e. The Suvorov.
f. The Russian 3rd division.
g. The Oslabaya sinks.



(5)
午後三時十五分頃「オスラービヤ」沈没當時ノ位置

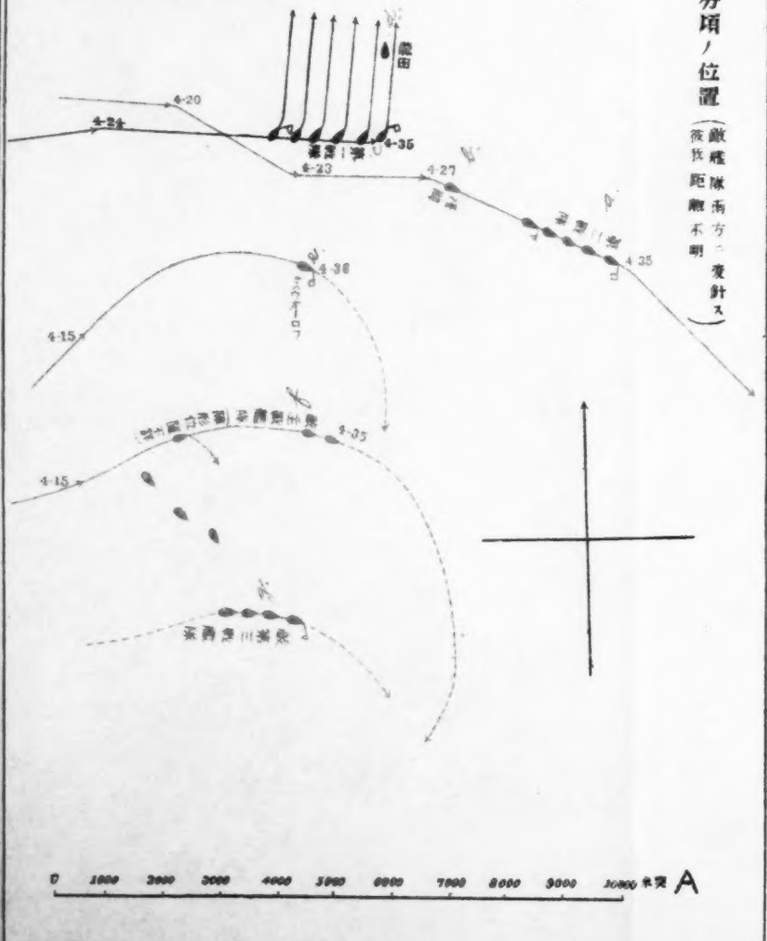




8. The position about 4.35 P. M.
   NOTE:—The enemy changed course to the south, range unknown.

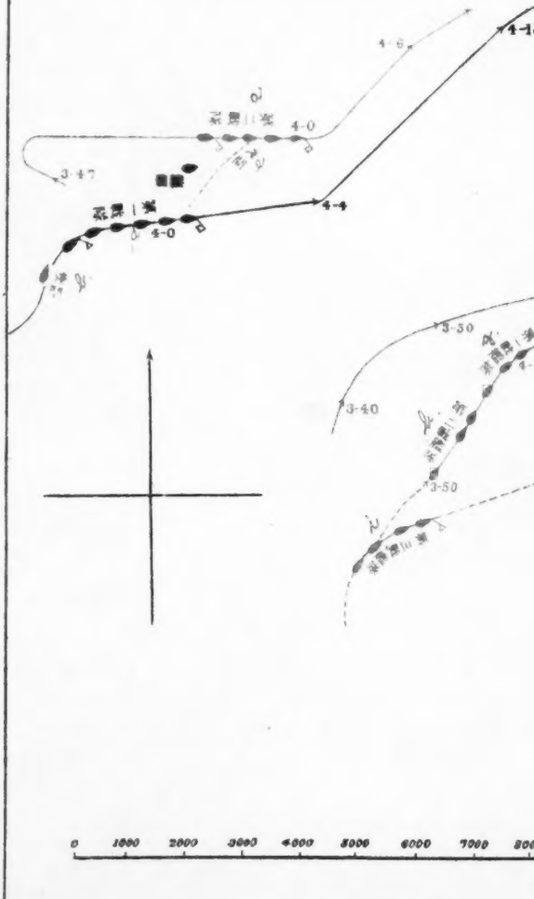
a. The 2nd division.
b. The Asama.
c. The 1st division.
d. The Tatsuda.
e. The Suvorov.
f. The enemy's main fleet (formation and position not clear).
g. The Russian 3rd division.

(8)
午後四時三十五分頃ノ位置
（敵艦隊南方ニ変針ス
後其距離不明）

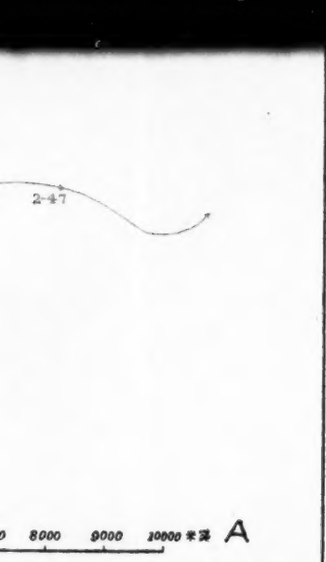


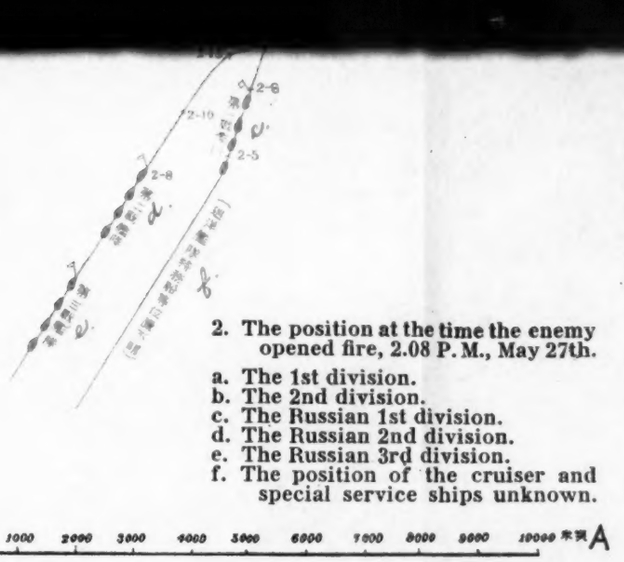
7. The position at 4.00 P. M. at the opening of t
   second phase.
   The enemy's position and formation not cle

a. The 2nd division.
b. The Asama.
c. The Tatsuda.
d. The 1st division.
e. The Asama.
f. The Suvorov.
g. The Russian 1st division.
h. The Russian 2nd division.
i. The Russian 3rd division.



LORD BALTD. PRESS BALTO. MD.

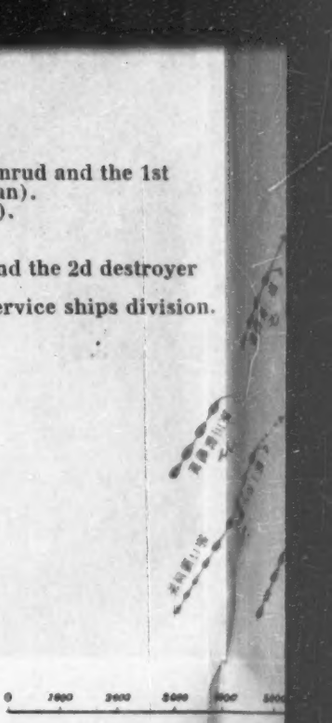




2. The position at the time the enemy opened fire, 2.08 P. M., May 27th.

a. The 1st division.
b. The 2nd division.
c. The Russian 1st division.
d. The Russian 2nd division.
e. The Russian 3rd division.
f. The position of the cruiser and special service ships unknown.

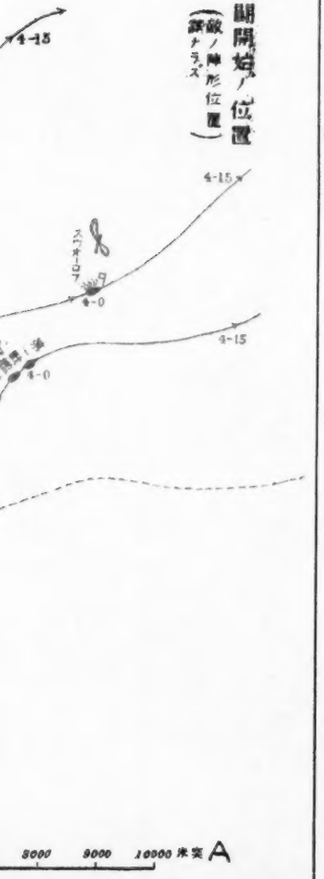
l. The 15th torpedo flotilla.
m. The 10th torpedo flotilla.
n. The 11th torpedo flotilla.
o. The 20th torpedo flotilla.
p. The 17th torpedo flotilla.
q. The 18th torpedo flotilla.
r. The Zhemtshug. The Izumrud and the 1st destroyer flotilla (Russian).
s. The 1st division (Russian).
t. The 2nd division.
u. The 3rd division.
v. The 1st cruiser division and the 2d destroyer flotilla (Russian).
w. The cruiser and special service ships division.



of the

t clear.

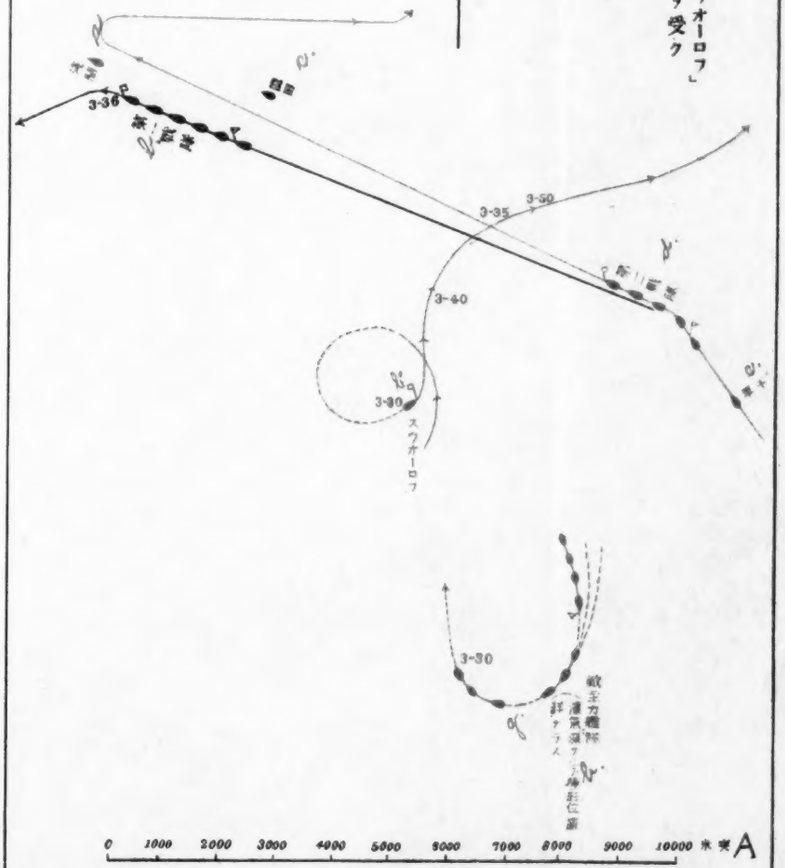
(7)
午後四時頃第二次戦闘開始ノ位置
（敵ノ陣形位置ハ霧ノ為メ判明セズ）



6. The Suvorov being isolated was attacked by the 1st and 2nd division at 3.30 P. M.

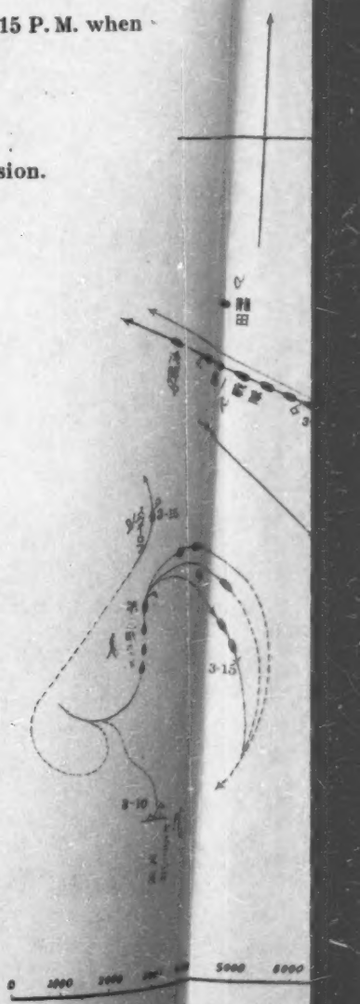
a. The Asama.
b. The 1st division.
c. The Tatsuda.
d. The 2nd division.
e. The Chihaya.
f. The Suvorov.
g. The enemy's main fleet.
h. Owing to the thick mist formations and positions not known.

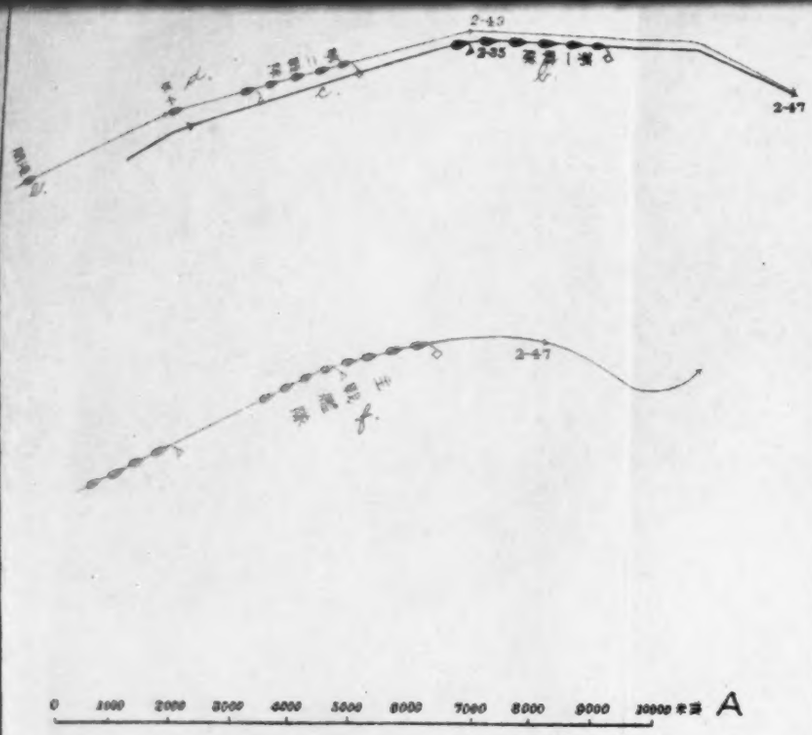
(6)
午後三時三十分頃「スウオーロフ」第一第二戦隊ノ猛撃ヲ受ク孤立シテ我カ

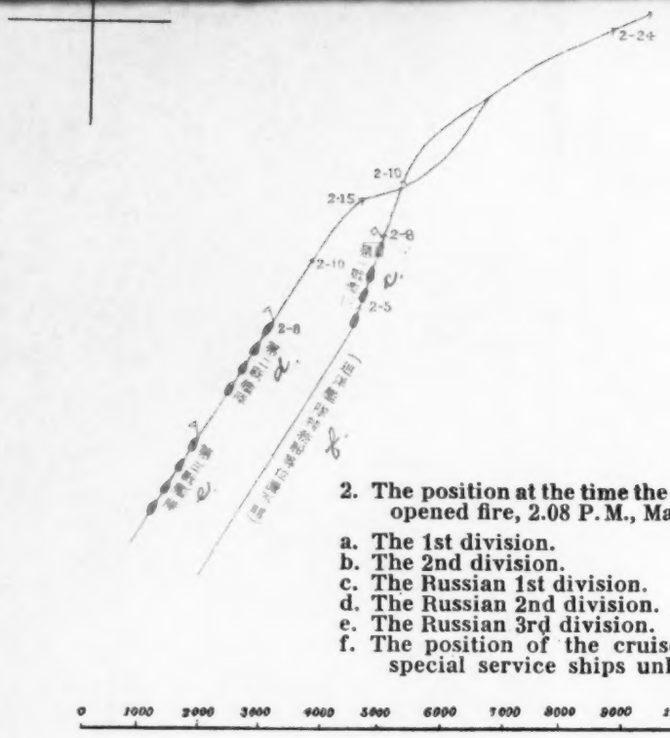


5. The position about 3.15 P. M. when the Oslabaya sunk.

a. The Tatsuda.
b. The Asama.
c. The 1st division.
d. The 2nd division.
e. The Suvorov.
f. The Russian 3rd division.
g. The Oslabaya sinks.







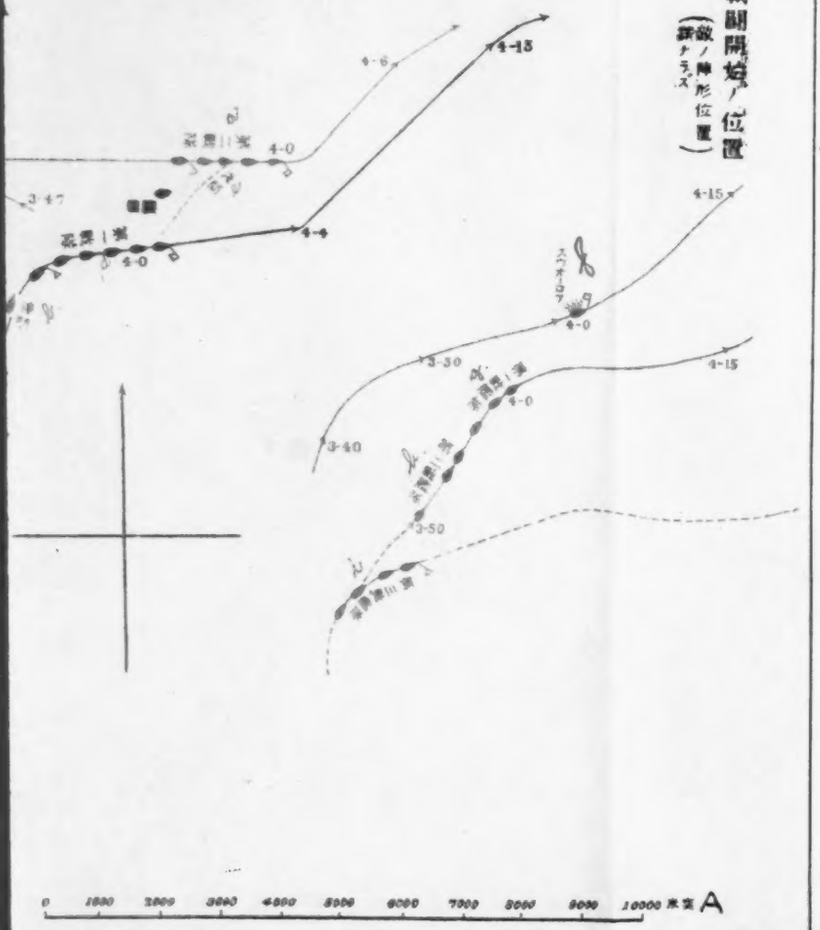
2. The position at the time the opened fire, 2.08 P. M., Ma

a. The 1st division.
b. The 2nd division.
c. The Russian 1st division.
d. The Russian 2nd division.
e. The Russian 3rd division.
f. The position of the cruis special service ships unl

7. The position at 4.00 P. M. at the opening of the second phase.
The enemy's position and formation not clear.

a. The 2nd division.
b. The Asama.
c. The Tatsuda.
d. The 1st division.
e. The Asama.
f. The Suvorov.
g. The Russian 1st division.
h. The Russian 2nd division.
i. The Russian 3rd division.

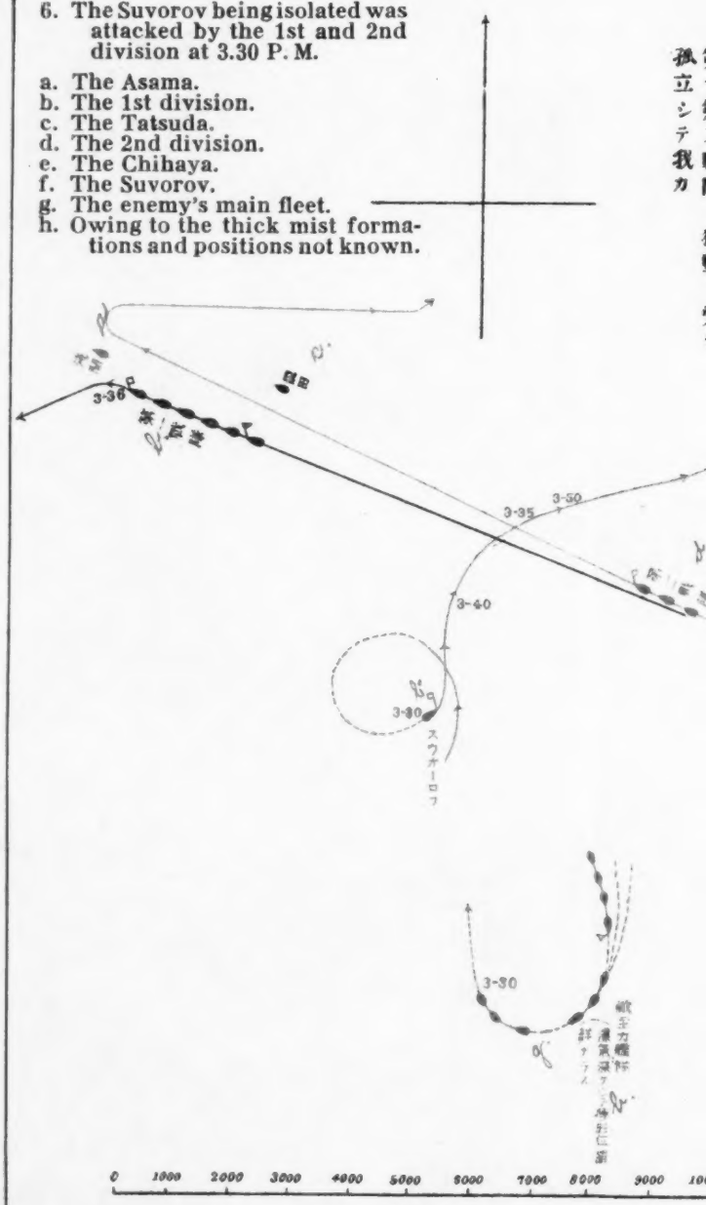
(7) 午後四時頃第二次戦闘開始ノ位置 (敵ノ陣形位置不詳ナラズ)



6. The Suvorov being isolated was attacked by the 1st and 2nd division at 3.30 P. M.

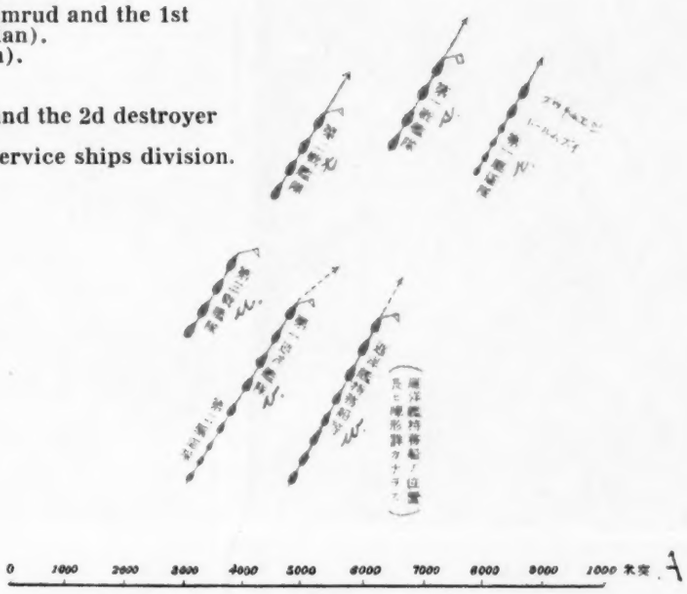
a. The Asama.
b. The 1st division.
c. The Tatsuda.
d. The 2nd division.
e. The Chihaya.
f. The Suvorov.
g. The enemy's main fleet.
h. Owing to the thick mist formations and positions not known.

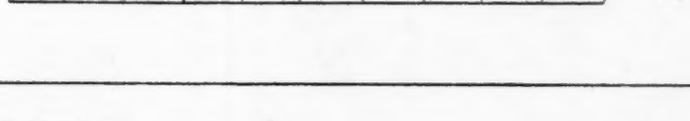
孤立シテ我カ



b. The 2nd division.
c. The 2nd destroyer flotilla.
d. The Chihaya.
e. The 5th destroyer flotilla.
f. The 1st and 3rd destroyer flotilla.
g. The 3rd division.
h. The 4th destroyer flotilla.
i. The 5th division.
j. The 6th division.
k. The Yaeyama.
l. The 15th torpedo flotilla.
m. The 10th torpedo flotilla.
n. The 11th torpedo flotilla.
o. The 20th torpedo flotilla.
p. The 17th torpedo flotilla.
q. The 18th torpedo flotilla.
r. The Zhemtshug. The Izumrud and the 1st destroyer flotilla (Russian).
s. The 1st division (Russian).
t. The 2nd division.
u. The 3rd division.
v. The 1st cruiser division and the 2d destroyer flotilla (Russian).
w. The cruiser and special service ships division.

(1)
二十七日午後一時五十五分ノ位置

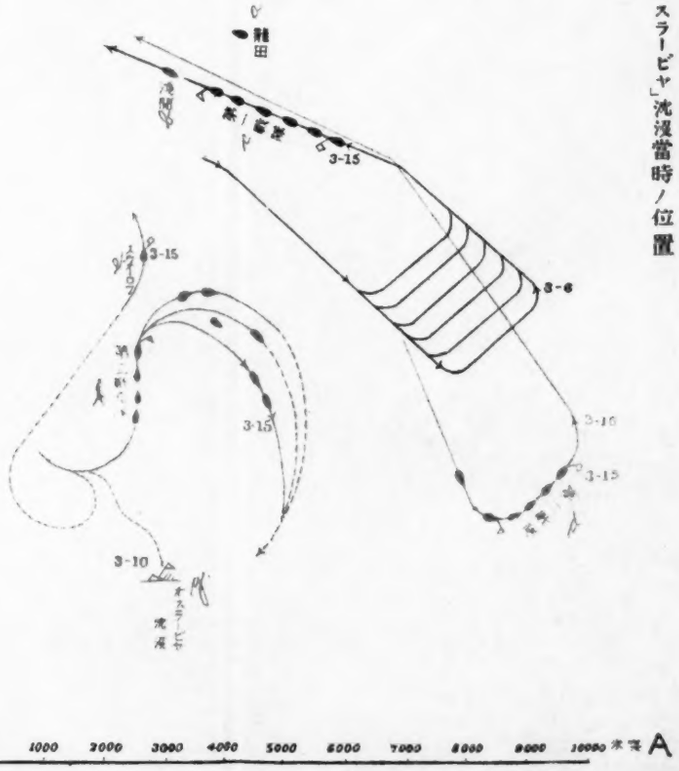


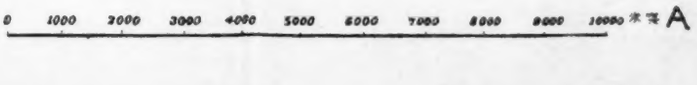


5. The position about 3.15 P. M. when the Oslabaya sunk.

a. The Tatsuda.
b. The Asama.
c. The 1st division.
d. The 2nd division.
e. The Suvorov.
f. The Russian 3rd division.
g. The Oslabaya sinks.

(5)
午後三時十五分頃「オスラービヤ」沈没當時ノ位置





(6)
午後三時三十分頃「スウオーロフ」第一第二戦隊ノ猛撃ヲ受ク孤立シテ我カ

mstlhug and *Izumrud,* were situated between the columns, guarding the front. In the rear, and hidden by the mist, were the *Oleg* and *Aurora,* and a division of second and third-class cruisers, as well as the *Dmitri Donskoi, Vladimir-Monomakh,* special service ships, etc. At this point the commander-in-chief, Admiral Togo, changed his course to the west and made signal which read: "The fate of the Empire depends upon this battle; let every man do his utmost." At 2.02 p. m. the main fleet changed course and cruised SW. by S. Apparently at first it was intended to run a counter course with the enemy, but at 2.05 p. m. the *Mikasa* suddenly changed course to ENE. The ships of the first and second divisions following, attempted to cross ahead of the enemy. The third, fourth, fifth and sixth divisions, standing to the south-d, seemed to operate against the enemy's rear. At this time the ling ship of the enemy, which was running NE. by N. at a dis-ce of 8000 meters southeast of the Japanese fleet, when she saw *Mikasa* change course, thinking it a good opportunity, opened e, and several other ships followed. The Japanese at 2.10 p. m. a range of about 6000 meters, first opened fire. The *Mikasa* ed upon the *Suvorov* and *Oslabaya,* the leading ships. The *ikasa* was followed by the other ships. Previous to this the right nk of the enemy advancing, running parallel to the left, seemed be about to form single line ahead, but now both columns, nging course to the eastward, formed an irregular single line d seemed to intend to cruise parallel with the Japanese fleet, hich also at times changed course. The Japanese destroyer flotil-s were operating at discretion outside the enemy's fire. The first d second divisions increasing the attack, the *Oslabaya* took fire, d black smoke poured from her. As both fleets drew in to about 00 meters, the Japanese fire increased in violence. The *Suvorov,* e leading ship, and the *Imperator Alexander III,* the second ip, both caught fire. The other ships one after another met the me fate. On account of the smoke and mist the Japanese at nes ceased firing. The damage to the Japanese fleet was con-derable. The steering gear of the *Asama* was damaged by a ell and this vessel for a time left the line for repairs, but con-ued to fire. Later she again joined the line. The main fleet, hile continuing the attack, ran to the southeastward and took sition ahead of the enemy. The enemy suddenly changing urse to NE., and crossing astern of the Japanese fleet, it was

feared that they might escape. The first division turning about at 3.06 p. m., formed a line ahead, the *Nisshin* leading, and cruised WSW. The second division for a time followed, but as it was discovered that the various ships of the enemy were again about to cruise to the eastward, the main fleet again resumed its original course, increased its speed and advanced directly. At this time, the *Suvorov* left the line. Several other ships did the same. At 3.07 p. m. the *Oslabaya* sank. The various ships of the enemy in a confused condition changed course to SE., but the second division, expecting them to stand to the westward, at 3.08 p. m. changed course 16 points to port, and opened fire with their port batteries while standing to the westward. The fifth destroyer flotilla advancing, attacked the *Suvorov*, which was isolated. The dispatch boat *Chihaya* drawing near also discharged a torpedo. The first division which was cruising WNW. in inverse order, on a counter course, opened a fierce fire with their port batteries. Then as the enemy again changed course, increasing the range, at 3.36 p. m. they changed course to port, made a complete turn and at 3.49 p. m. formed line ahead in regular order, cruised to the northeast and pressed the enemy which was then to the southeastward, later turning to the northward. The second division, changing course to starboard, took position ahead of the first division. Both fleets steamed NE. The enemy seeing it impossible to advance directly, gradually changed course to starboard and seemed to escape to the southward. Hereupon the second division, followed by the first division, changed course to the southward. The distance becoming greater, the second division turned to starboard, and took position on the bow of the first division, then from about 5 p. m. they cruised south together. The first destroyer flotilla attacked the *Suvorov*, which was isolated. The first and second divisions on account of smoke and mist lost sight of the enemy's main body and engaged in slow fire on the cruiser and transport divisions which now and then appeared. About 5.27 p. m. the first division again changed course to the northward and searched for the enemy's main fleet. The second division knew by the sound of gun-fire that the third division was engaged with the enemy's cruiser division and changed course to the southward. Thus these divisions had separated and operated independently. The first division, which was cruising on a course NNW., attacked the enemy (which now and then were picked up), with their port batteries. At about 5.50 p. m. they

sank the converted cruiser *Ural* which was close at hand. Turning more to the northward, they discovered several ships of the enemy on the port bow. These ships appeared to be escaping to the northeastward, and drawing near, when on parallel courses they pressed the enemy hard. The enemy gradually easing off to port, ran to the northwestward. The Japanese coming out ahead of these ships directed a severe fire upon them. As a result of this, the *Imperator Alexander III* left the line and dropped astern. The *Borodino*, the leading ship (the enemy at this time it was said was cruising in the following order: *Borodino, Orel, Nikolai I, Appraxin, Seniavin, Ushakov, Navarin, Sissoi Veliky, Nakhimov*) took fire and at 7.23 p. m. suddenly sank. At this time the sun had nearly set. The Japanese torpedo craft from the northeastward and southward gradually closed in on the enemy. The commander-in-chief, Admiral Togo, at 7.28 p. m. (sunset) ordered all ships to cruise north and gather at Utsuryoto by the next morning. The first division ceased firing and changed course to the eastward. The second division, which had separated from the first division, cruised to the westward and pursued the enemy for a while. Knowing that it would be impossible to overtake them, and as it was sunset, and not wishing to get too far away from the first division, at 6 p. m. they proceeded north to where they would most likely find them. At 6.30 p. m. the second division attacked the enemy's fleet, which again appeared on the port bow, and at 7 p. m., observing the *Alexander III* to sink, ceased firing and at 8.08 p. m. joined the first division. This concluded the operations of the main fleet for the first day. At 2 p. m. when the first and second divisions opened fire on the enemy's main fleet, the third, fourth, fifth and sixth divisions, in order to attack the transports, and the *Oleg, Aurora, Svietlana, Almaz, Dmitri Donskoi, Monomakh*, and the other craft, separated from the first and second division and stood rapidly to the southward. The third and fourth divisions opened fire on the enemy's cruiser division at 2.45 p. m. on a counter course, then turning and attacking their rear, passed to starboard and engaged them on a parallel course. With superior speed changing front at will they appeared on either flank whenever they so desired. The movements greatly confused the enemy and about 4 p. m. their formation was disorganized. At about 4.20 p. m. the fourth division attacked a transport (thought to have been the *Rus*) and inflicted great damage on

another ship (thought to have been the *Irtish*). This ship sank on the 28th off Hamada, Iwami Province. About this time the fifth and sixth division joined. (The sixth division, before joining, overtook two hospital ships which were turned over to the *Manshu Maru* and the *Sado Maru* for detention.) About 4.40 p. m. four ships, thought to be battleships or seacoast defence ships, which were attached to the main fleet of the enemy, steamed south and joined the cruiser division. This move was perplexing to the fourth and sixth divisions. The *Naniwa* was damaged on the port quarter at the water line. She for a time avoided the engagement and made repairs. The *Kasagi*, about 3.08 p. m., receiving a shell in her port coal bunkers, made water rapidly and Admiral Dewa ordered the *Niitaka* and *Otowa* of his division to report to the first division. He, at 6 p. m., with the *Chitose* as convoy, took the *Kasagi* to Aburadina Bay. At 5.50 p. m. the second division coming from the northward, attacked the enemy's cruiser division and caused great confusion in their line. The greater part of these ships escaped to the northward, pursued by the fourth, fifth and sixth divisions. On the way they came across the *Suvorov*, which had become unmanageable, and the repair ship *Kamchatka*. The fourth division, while runing north, opened fire on these ships, and the fifth and sixth divisions completed their destruction. The *Kamchatka* sank at 7.10 p. m. The 11th torpedo flotilla, operating with the fifth division, took part in the destruction of the *Suvorov* which sank at 7.20 p. m. As orders had been received to proceed to Utsuryoto, firing was ceased and all headed north. The special service ships proceeded to the scene of action to pick up any of the enemy's ships which had become unmanageable. The seventh division on this date took no active part. The commander-in-chief, Admiral Togo, sent a telegram to the imperial headquarters and later reported in detail the operations of each division.

DETAILED ACCOUNT OF THE BATTLE OPERATIONS OF THE FIRST DIVISION

THE FIRST PHASE

The *Mikasa*, flagship of Commander-in-Chief Togo, the *Shikishima*, the *Fuji*, the *Asahi*, the *Kasuga*, and the *Nisshin* and the despatch boat *Tatsuda*, in a single line ahead, (the *Tatsuda* to port), followed by the second division, at 1.39 p. m., May 27, when

cruising 10 sea miles northwest of Okinoshima, discovered in the mist to the southwest the enemy's fleet, which was then on course NE. by N. The Japanese fleet fixed their course at 2.02 p. m. SW. by W., showing an intention to cruise on a counter course with the enemy, but after about three minutes, quickly changed course to ENE. and attempted to cross ahead of the enemy. At this time the enemy was about 8000 meters southeast of the Japanese fleet. The right column advanced slightly ahead of the left and seemed about to form line ahead. At this time, 2.08 p. m., the *Shikishima*, the second ship, turning, took a new course. The *Suvorov*, the leading ship of the enemy, opened fire at 7000 meters and was soon followed by the other ships. The fire was concentrated upon the two leading Japanese ships and shells fell everywhere around them. The Japanese ships did not reply. At 2.10 p. m. the *Mikasa*, estimating the *Suvorov's* range at 6400 meters, opened fire. She was followed by the other ships. The *Shikishima*, the second ship, at 2.10 p. m., at an estimated range of 6800 meters concentrated on the *Oslabaya*. The third ship, the *Fuji*, at 2.11 p. m., at an estimated range of 6200 meters, also concentrated on the *Oslabaya*. The fourth ship, the *Asahi*, at 2.12 p. m., at an estimated range of 7000 meters, concentrated on the *Suvorov*. The *Kasuga*, the fifth ship, at the same time, at an estimated range of 5800 meters, concentrated on the *Oslabaya*. The sixth ship, the *Nisshin*, at 2.15 p. m. at an estimated range of 7000 meters, also concentrated on the *Oslabaya*. A WSW. wind blowing, the sea was high. The ships rolled considerably and the guns on the main deck to windward were often submerged and aiming was very difficult. At 2.12 p. m., drawing in to about 5500 meters, the enemy gradually changed course to starboard and cruised nearly parallel with the Japanese ships in an irregular single line. The range at this time becoming greater, the first division at 2.15 p. m. changed course to E. by S. in order to decrease it. The battle now was at its height and the splash of the shells often reached to the upper bridges. At 2.18 p. m., at a range of about 5400 meters, the first division changed course to NE. by E. ½ E. and cruised parallel with the enemy. At a range of 4600 meters a quick fire was opened with all guns including the 12-pounders. The second division followed the first. The first division, keeping their formation, whereby the third and fourth ships were abeam of the leading ship of the enemy, concentrated on the *Suvorov* and *Oslabaya*. The remain-

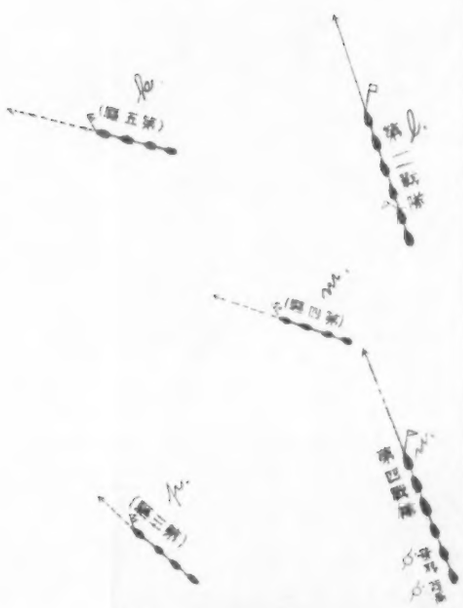
ing ships concentrated upon others of the enemy. The enemy fought bravely, but their lines became disorganized and on account of ships catching fire their hulls were enveloped in smoke. The *Mikasa* was struck by ten large caliber shells and all the other ships received more or less damage. At 2.24 p. m. the first division changed course slightly to starboard and at 2.35 p. m. headed true east and pressed harder on the enemy's front. The enemy unable to stand such a severe attack, at 2.35 p. m. changed course to E. by N. and then to E. ½ S. showing an intention to escape. The first division, keeping at a range of from 5000 to 6000 meters, hung on the enemy's front and continued to fire. At times the firing was stopped on account of the smoke. At 2.43 p. m. the first division changed course to ESE. and then to SE. ½ E., and together with the second division gave the enemy a raking fire. The enemy's ships were greatly confused and damaged. The flagship *Suvorov* and the *Oslabaya* had lost their stacks, their masts were destroyed and their hulls were enveloped in flame and smoke. The *Oslabaya* listing to port, down by the head, left the line and went out of range. Again turning to port and leading the other ships, she showed intention to attack the Japanese center. The first division, fearing they would escape to the northward by crossing astern, made an 8-point turn to port at 2.58 p. m., and separating from the second division, steamed NE. At 3.05 p. m. the first division ceased firing and again turning 8 points to port, formed a single line ahead with the *Nisshin* as leading ship, the *Tatsuda* to starboard, and stood WNW.

THE SECOND PHASE

The enemy in the first phase had received great damage. The *Oslabaya* had sunk and the *Suvorov* had left the line. The first division of Japanese ships which had previously changed course 16 points to port, and were on course WNW., led by the *Nisshin*, at 3.07 p. m. opened severe fire on the enemy's front with their port batteries, at an estimated range of 5000 meters. The enemy with no semblance of formation were in great distress. The Japanese taking advantage of this, increased the severity of the attack at a range of from 2000 to 3000 meters. A torpedo attack was also carried out. At 3.24 p. m. the Japanese passing entirely through the enemy's lines had them on the port quarter. The enemy changed course and, as the range increased, were soon lost

第二戰隊
(第二艦)
(第三艦)
(第四艦)
(第五艦)
(第六艦)
(第七艦)
(第八艦)
(第九艦)
(第十艦)
(第十一艦)
(第十二艦)
(第十三艦)
(第十四艦)
(第十五艦)
(第十六艦)
(第十七艦)
(第十八艦)
(第十九艦)
(第二十艦)
(第二十一艦)
(第二十二艦)
(第二十三艦)
(第二十四艦)
(第二十五艦)
(第二十六艦)
(第二十七艦)
(第二十八艦)
(第二十九艦)
(第三十艦)
(第三十一艦)
(第三十二艦)
(第三十三艦)
(第三十四艦)
(第三十五艦)
(第三十六艦)
(第三十七艦)
(第三十八艦)
(第三十九艦)
(第四十艦)
(第四十一艦)
(第四十二艦)
(第四十三艦)
(第四十四艦)
(第四十五艦)
(第四十六艦)
(第四十七艦)
(第四十八艦)
(第四十九艦)
(第五十艦)
(第五十一艦)
(第五十二艦)
(第五十三艦)
(第五十四艦)
(第五十五艦)
(第五十六艦)
(第五十七艦)
(第五十八艦)
(第五十九艦)
(第六十艦)
(第六十一艦)
(第六十二艦)
(第六十三艦)
(第六十四艦)
(第六十五艦)
(第六十六艦)
(第六十七艦)
(第六十八艦)
(第六十九艦)
(第七十艦)
(第七十一艦)
(第七十二艦)
(第七十三艦)
(第七十四艦)
(第七十五艦)
(第七十六艦)
(第七十七艦)
(第七十八艦)
(第七十九艦)
(第八十艦)
(第八十一艦)
(第八十二艦)
(第八十三艦)
(第八十四艦)
(第八十五艦)
(第八十六艦)
(第八十七艦)
(第八十八艦)
(第八十九艦)
(第九十艦)
(第九十一艦)
(第九十二艦)
(第九十三艦)
(第九十四艦)
(第九十五艦)
(第九十六艦)
(第九十七艦)
(第九十八艦)
(第九十九艦)
(第一百艦)

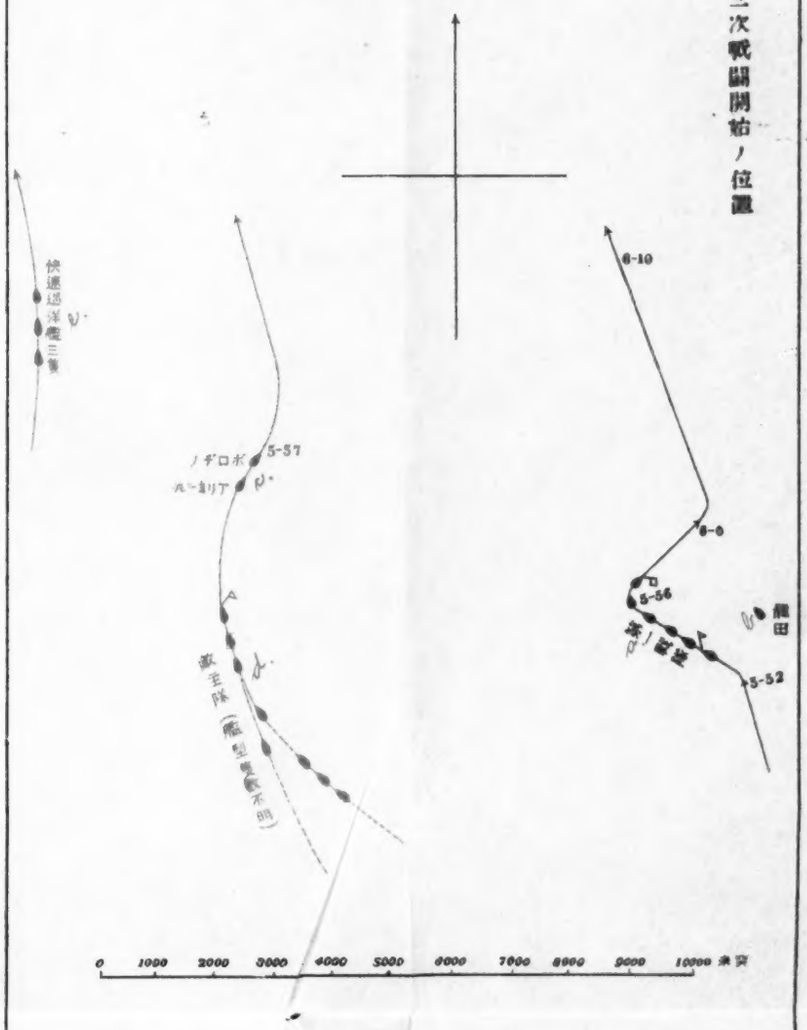
(12)
午後七時三十分ノ位置
敵ノ隻数及ヒ位置不明



10. The position at the opening of the 3rd phase at 5.57 P. M.

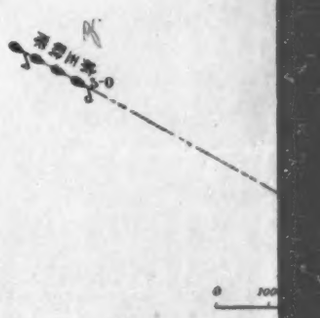
a. The 1st division.
b. The Tatsuda.
c. The Borodino and the Orel.
d. The enemy's main fleet.
e. Three of the Russian cruiser division.

(10)
午後五時五十七分第三次戦闘開始ノ位置



9. The position at 5.00 P. M. (the enemy's formation and position not clear).

a. The 1st division.
b. The Tatsuda.
c. The 2nd division.
d. The Asama.
e. The 3rd division.
f. The 4th division.
g. The 5th division.
h. The Suvorov.
i. Two ships of the Borodino type.
j. The Russian 3rd division.
k. The Russian cruiser division.
l. The 6th division.



11. The position at 7.00 P. M., the time the Alexander the III sunk.

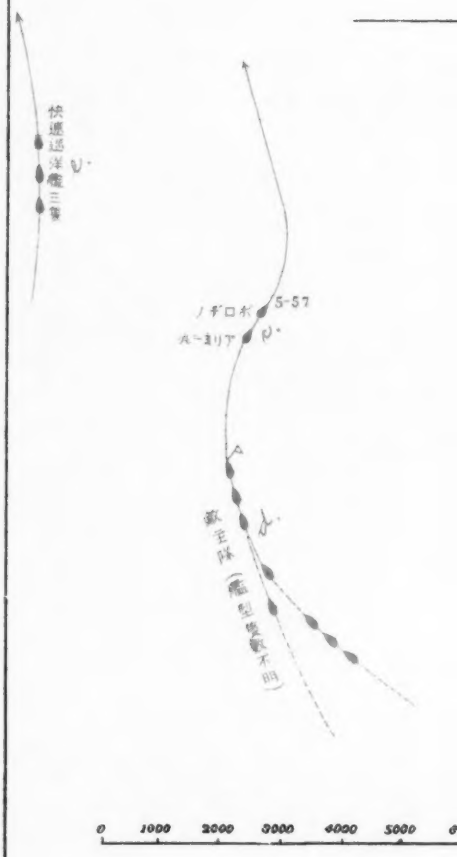
a. The 1st division.
b. The Tatsuda.
c. The Chihaya.
d. The enemy's main fleet (the Borodino, Orel, Nikolai the I, Apraxin, Seniavin).
e. Part of the enemy's main fleet (the Ushakoff, Navarin, Sissoi Veliky, Nakhinov).
f. The Izumrud.
g. The Alexander the III.
h. The 2nd division.

(12)
午後七時三十分ノ位置

敵ノ隻数及ヒ位置不明

10. The position at the opening of
3rd phase at 5.57 P. M.

a. The 1st division.
b. The Tatsuda.
c. The Borodino and the Orel.
d. The enemy's main fleet.
e. Three of the Russian cruiser di

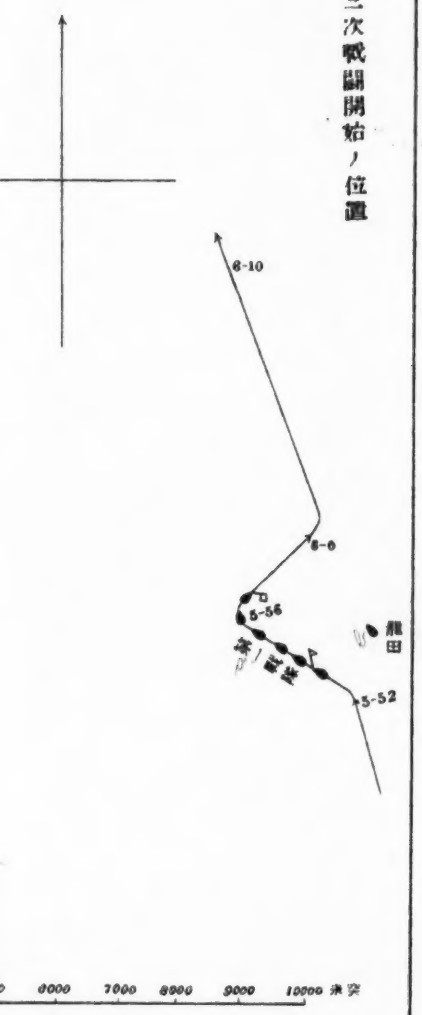


g of the

.

er division.

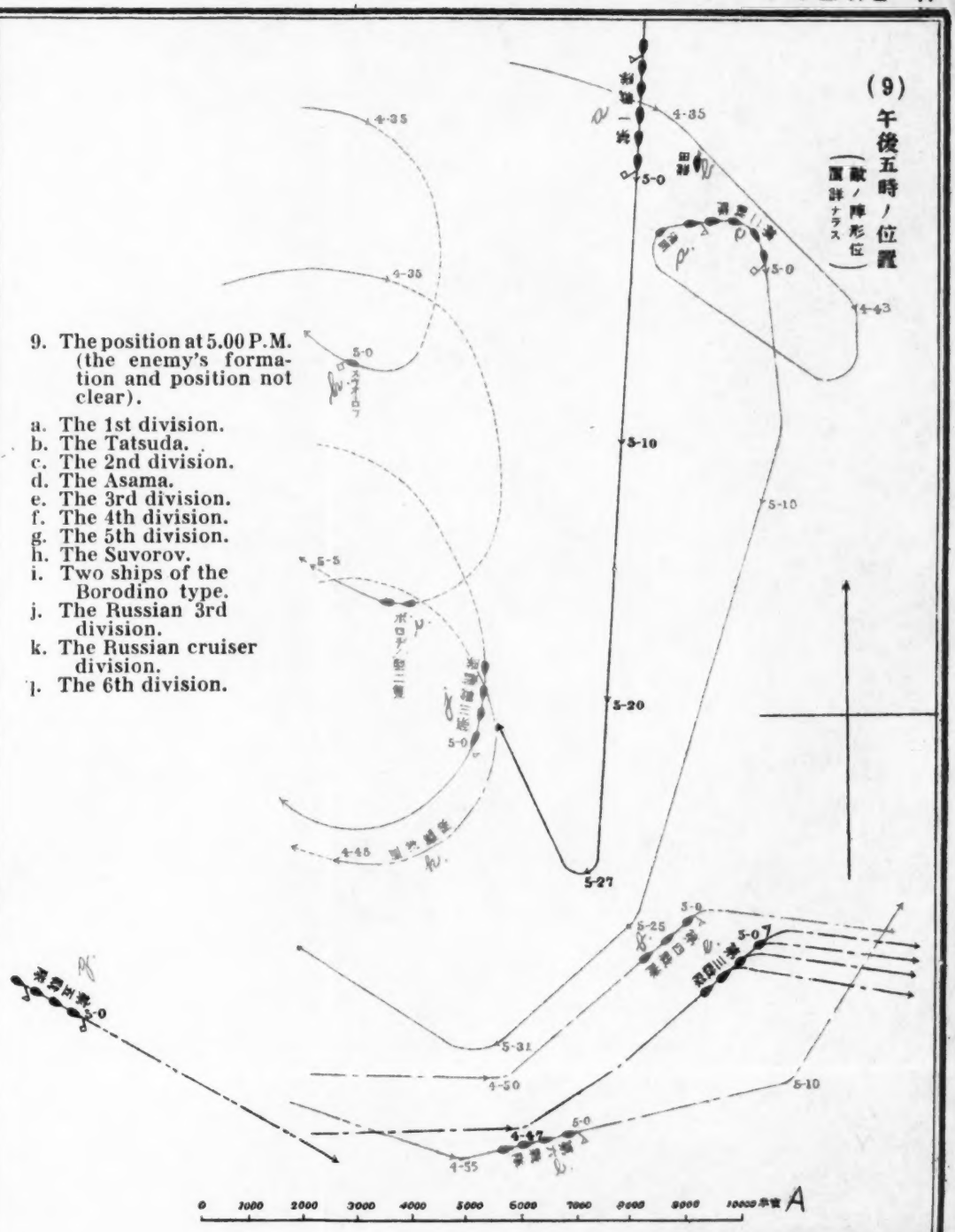
(10) 午後五時五十七分第三次戰闘開始ノ位置



9. The position at 5.00 P.M. (the enemy's formation and position not clear).

a. The 1st division.
b. The Tatsuda.
c. The 2nd division.
d. The Asama.
e. The 3rd division.
f. The 4th division.
g. The 5th division.
h. The Suvorov.
i. Two ships of the Borodino type.
j. The Russian 3rd division.
k. The Russian cruiser division.
l. The 6th division.

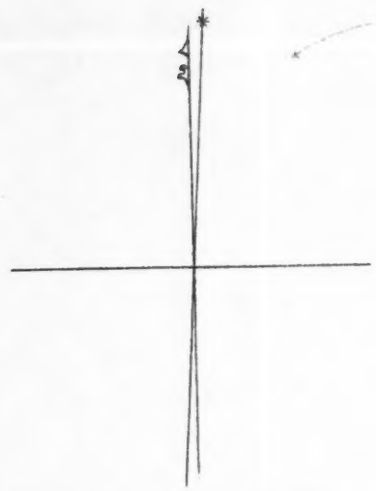
(9) 午後五時ノ位置 (敵ノ陣形位置詳ナラス)



11. The position at 7.00 P. M., the time the Alexander the III sunk.

a. The 1st division.
b. The Tatsuda.
c. The Chihaya.
d. The enemy's main fleet (the Borodino, Orel, Nikolai the I, Apraxin, Seniavin).
e. Part of the enemy's main fleet (the Ushakoff, Navarin, Sissoi Veliky, Nakhinov).
f. The Izumrud.
g. The Alexander the III.
h. The 2nd division.

(11) 午後七時頃「アレクサンドル三世

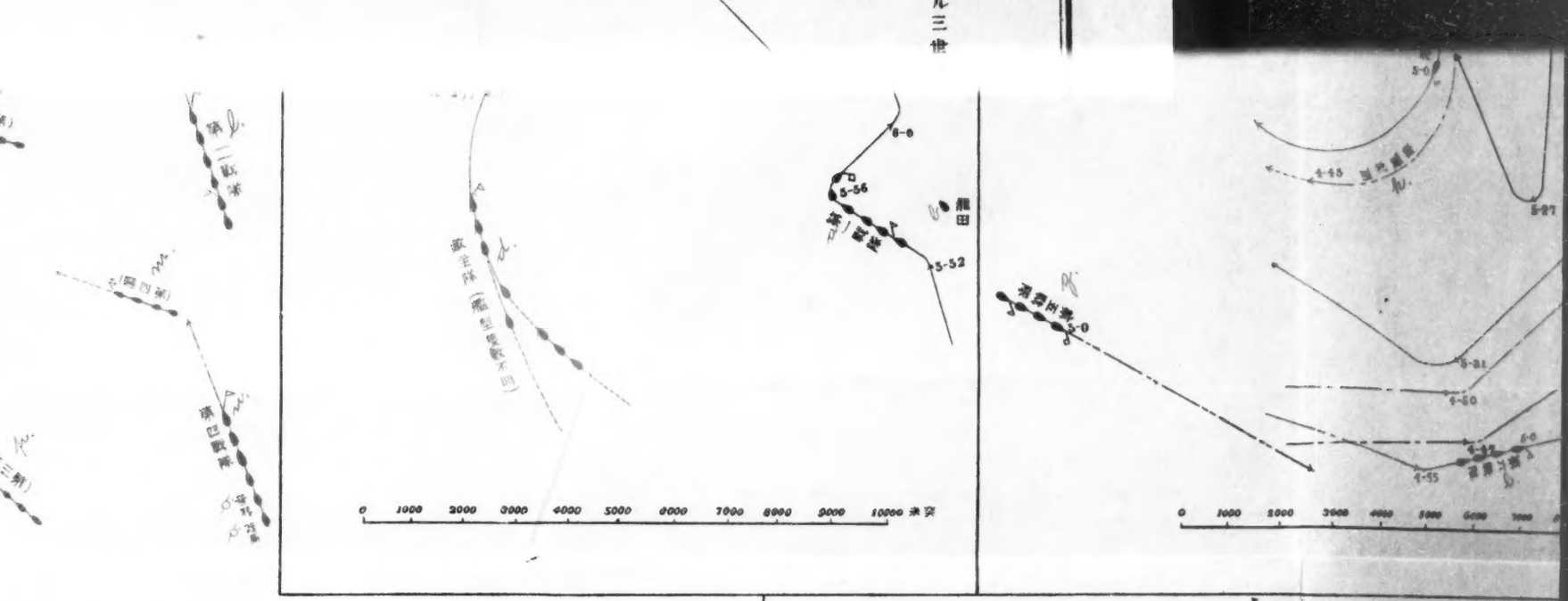


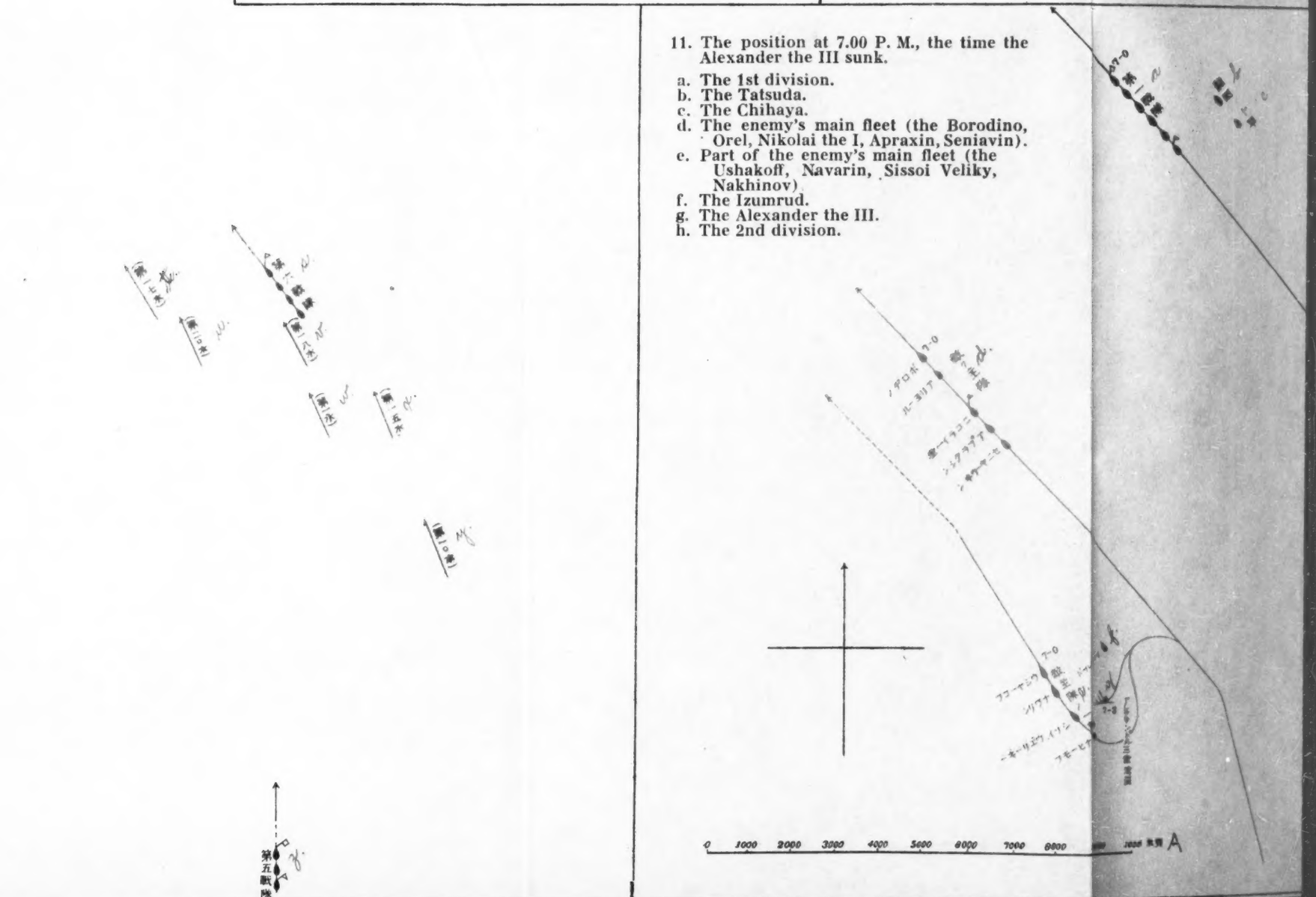
12. The position at 7.30 P. M. (the enemy's number and position not clear.

a. The 1st division.
b. The Tatsuda.
c. The Chihaya.
d. The 9th torpedo flotilla.
e. The 1st destroyer flotilla.
f. The 2nd destroyer flotilla.
g. The Russian cruisers.
h. The Russian destroyer flotilla.
i. The Russian main fleet.
j. Part of the Russian main fleet.
k. The 5th destroyer flotilla.
l. The 2nd division.
m. The 4th destroyer flotilla.
n. The 4th division.
o. The Otowa and Niitaka.
p. The 3rd destroyer flotilla.
q. The enemy's cruiser and special service ships divisions.
r. The Russian destroyer flotilla.
s. The 6th division.
t. The 17th torpedo flotilla.
u. The 20th torpedo flotilla.
v. The 18th torpedo flotilla.
w. The 1st torpedo flotilla.
x. The 15th torpedo flotilla.
y. The 10th torpedo flotilla.
z. The 5th division.

A. Metres.
B. Sea Miles.

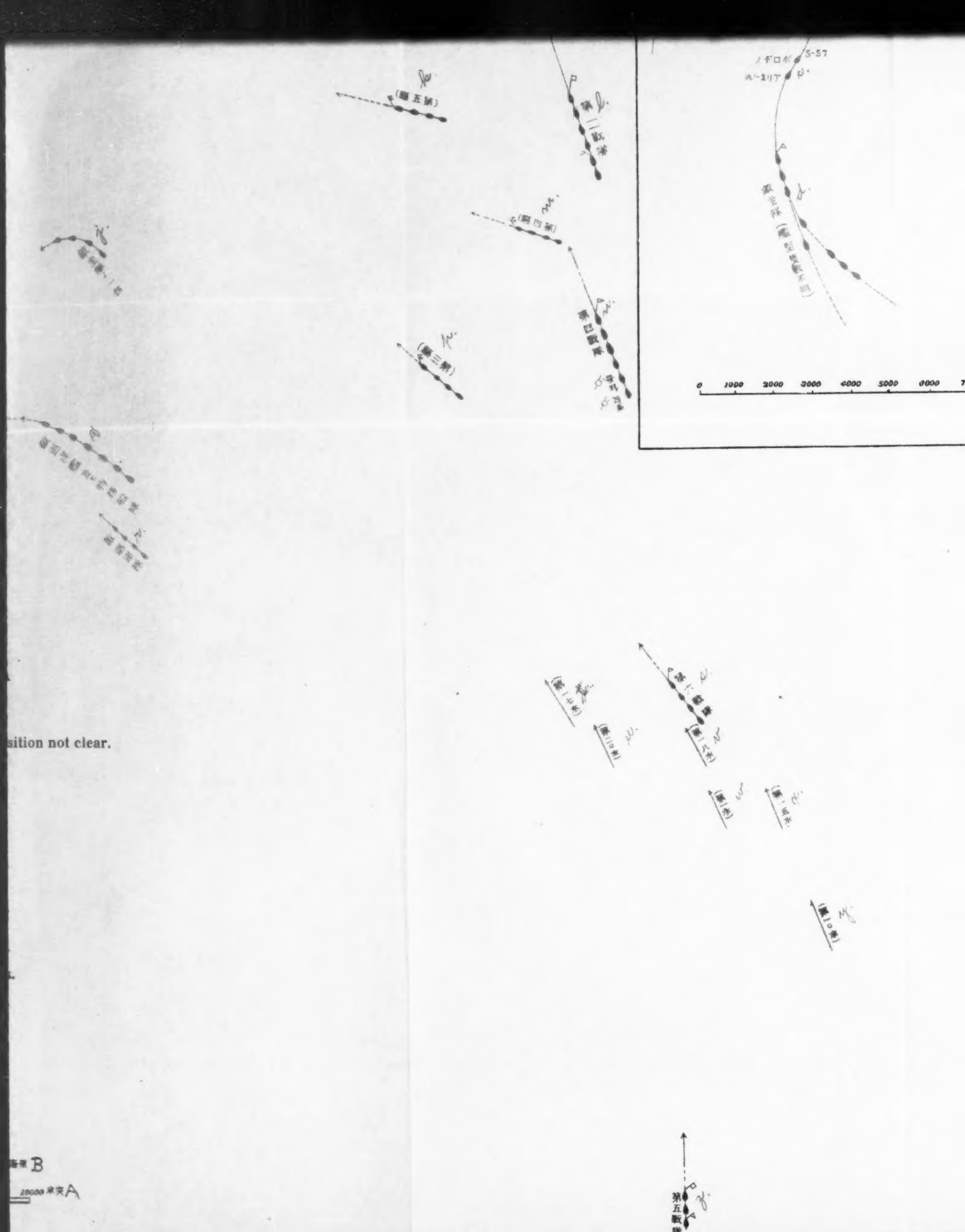
LORD BALTO. PRESS BALTO. MD.



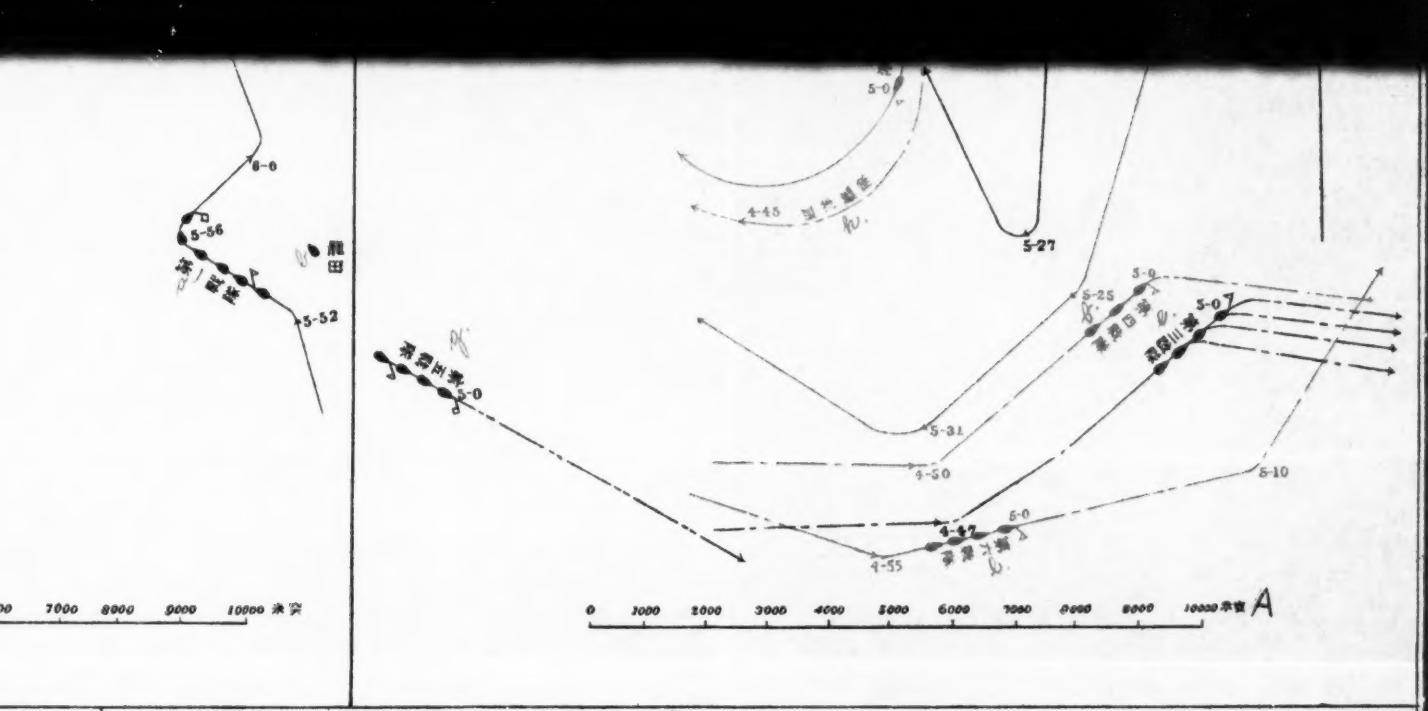


11. The position at 7.00 P. M., the time the Alexander the III sunk.

a. The 1st division.
b. The Tatsuda.
c. The Chihaya.
d. The enemy's main fleet (the Borodino, Orel, Nikolai the I, Apraxin, Seniavin).
e. Part of the enemy's main fleet (the Ushakoff, Navarin, Sissoi Veliky, Nakhinov)
f. The Izumrud.
g. The Alexander the III.
h. The 2nd division.



sition not clear.

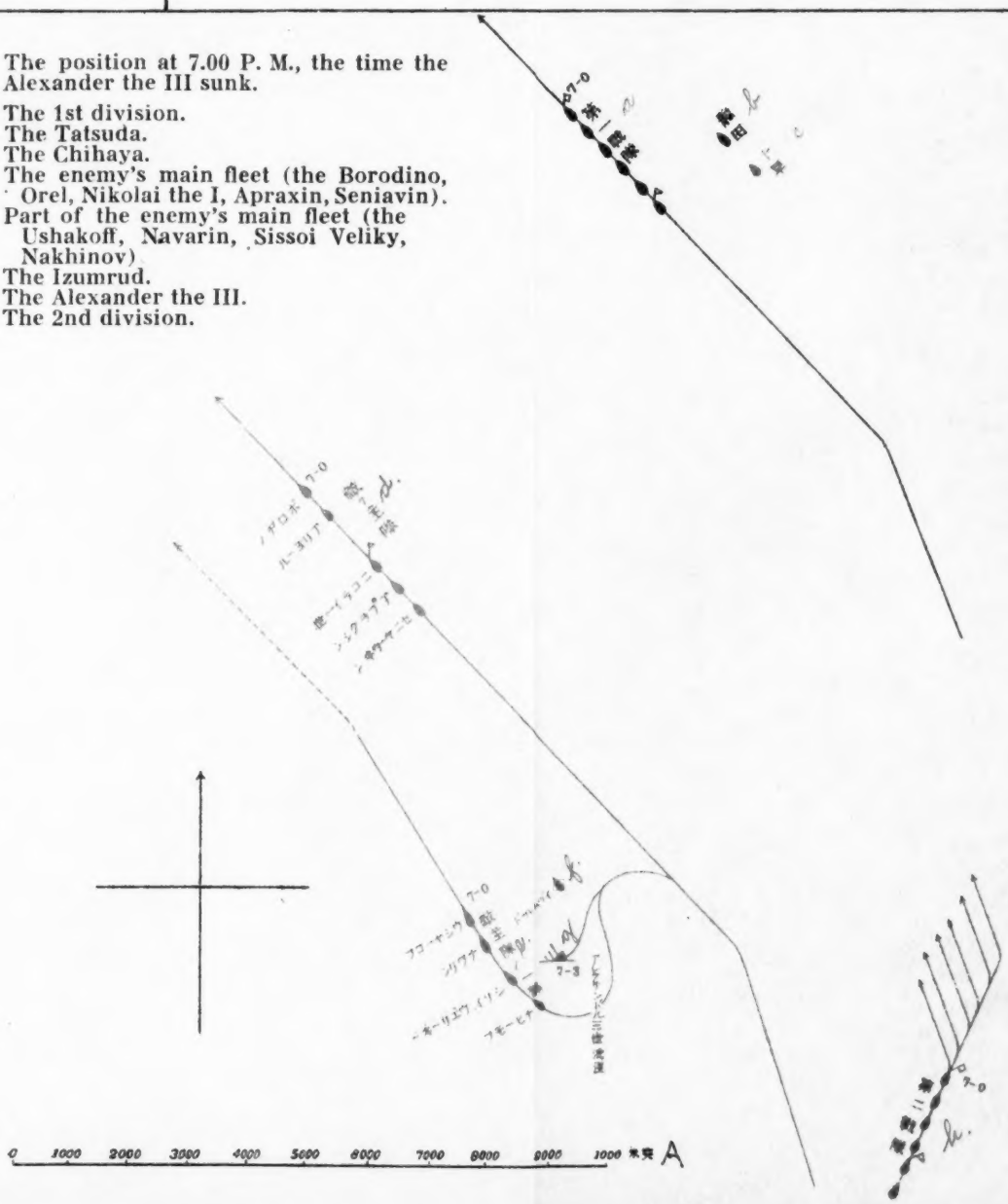


11. The position at 7.00 P. M., the time the Alexander the III sunk.

a. The 1st division.
b. The Tatsuda.
c. The Chihaya.
d. The enemy's main fleet (the Borodino, Orel, Nikolai the I, Apraxin, Seniavin).
e. Part of the enemy's main fleet (the Ushakoff, Navarin, Sissoi Veliky, Nakhinov)
f. The Izumrud.
g. The Alexander the III.
h. The 2nd division.

(11)

午後七時頃「アレクサンドル三世」沈没ニ瀕セル位置



in the smoke and haze. The first division ceased firing, changed course 4 points to port, then making a second change of 8 points to port, assumed the original formation. The *Mikasa* leading with the *Tatsuda* on the port side, they ran NE. The enemy's flagship had already left the line and the second ship, *Imperator Alexander III,* became the leading ship. Leading the *Borodino, Orel, Sissoi Veliky, Nakhimov* and the other ships, she turned gradually to starboard. At about 4 p. m., being lost to view, their condition and formation were not known. The only thing that could be made out was the fierce attack of the *Chiyoda* and destroyer flotilla on the *Suvorov* about 7000 meters to the eastward. At about 3.58 p. m. the enemy was picked up to the eastward and southward at about 7000 meters distance. The *Mikasa* at 4.01 p. m., at a range of about 6500 meters, opened fire with her starboard battery. The other ships followed. At 4.04 p. m. the course was changed to NE. and at 4.15 p. m. was again changed to ENE. with the intention of drawing nearer the enemy. The enemy's fire gradually slackened and their line was in a desperate condition. The *Suvorov* presented a pitiful sight. All her upper works were swept away and black smoke covered her hull and gushed from the gun ports. The enemy gradually changed course to starboard and were followed by the Japanese ships. The *Mikasa* at a range of about 2000 meters discharged a torpedo, and at 4.24 p. m. took a course to the eastward. The enemy turning more and more to starboard, there was some doubt whether they would cross astern of the Japanese ships or escape to the northward. In order to command their course the first division at 4.35 p. m., making a turn of 8 points to port, and forming line abreast, stood to the northward, but as the enemy showed an inclination to run south, the first division turning 8 points to starboard, formed a line ahead and stood SE. by E. This time the destroyers were ordered to attack. The enemy's whereabouts became unknown on account of the fog and smoke. The first division at 4.51 p. m. changed their course to the southward and, being led by the second division, searched for the enemy until 5 p. m. At 5 p. m. they picked up bearing W. by S. two ships of the *Borodino* type cruising on a counter course, and at a range of about 6000 meters exchanged fire with them. Then after an attack on the converted cruiser *Ural,* which appeared to the westward and southward, at a distance of 5000 meters, this division cruised south in search of the enemy's main fleet.

THE THIRD PHASE

The first division, while cruising south, led by the second division, bombarded the enemy's cruisers. After pursuing the enemy's main fleet for about one half hour, they lost them in the smoke and mist. The first division, concluding that the enemy must be to the northward, at 5.28 p. m., separating from the second division, changed course to NNW., the *Tatsuda* taking position to starboard. The converted cruiser *Ural,* which was drifting alone, was sunk by a torpedo and then great damage was inflicted on the repair ship *Kamchatka.* At 5.52 p. m. the enemy's destroyers were discovered, and changing course to WNW. the first division gave chase to them but they escaped to the northeastward. The enemy's fleet was now discovered bearing WNW., and at a range of 6300 meters fire was exchanged. At 6 p. m. the course was changed to NNW. The main strength of the enemy, which had escaped to the southward at the close of the second phase, had now joined with a part of the cruiser division which had escaped after their engagement with the third Japanese division, and it seemed that they had formulated a plan of escape. At 6 p. m., at the opening of the engagement, the first division concentrated on the enemy's leading ship. At 6.25 p. m. the *Mikasa* was abeam of the leading ship at a range of 5500 meters. The shooting became more accurate as the mist and smoke lifted and the fire was concentrated on the *Orel,* the second ship. The enemy at first were on course north but gradually changed to northwest. On account of this the range became greater and at 6.42 p. m. it was about 6600 meters. Although the range was great the hits were numerous. The number one ship of the enemy had her mainmast shot away and fire was raging aft. (At 7.30 p. m. an explosion, which seems to have occurred in the magazine, took place and this ship sank.) As darkness was approaching and as the range had become greater, at 7.10 p. m. the *Mikasa,* followed by the other ships, ceased firing and at 7.20 p. m., changing course to the northward, moved to her assigned position for the night. At this time the sun had sunk into the sea and darkness came on. The Japanese torpedo craft from the north, east and south took up the chase. In the first day's fighting, although the Japanese had wrought great havoc to the enemy, they themselves sustained great damage. The flagship *Mikasa,* the main target of the enemy, was hit more than 30 times. The inside of the forward conning-tower was

damaged. Both bridges were struck and damaged. All the members of one gun's crew were either killed or wounded. Stacks were pierced and one gun was destroyed. The casemates and decks were damaged. Killed: 8 seamen. Wounded: 6 officers, 1 petty officer and 98 seamen. The second ship, the *Shikishima,* was struck ten times. All of one gun's crew were either killed or wounded. Tops were pierced and upper and lower decks damaged. Killed: 1 officer and 12 seamen. Wounded: 4 officers, 1 midshipman and 20 seamen. The third ship, the *Fuji,* was struck 11 times. Her hull and guns were damaged. Killed: 8 seamen. Wounded: 5 officers, 1 midshipman, 1 petty officer and 17 seamen. The fourth ship, the *Asahi,* was struck several times. Killed: 1 officer and 7 seamen. Wounded: 1 officer and 22 seamen. On the fifth ship, the *Kasagi,* several seamen were killed and 1 officer, 1 midshipman and 18 seamen wounded. The sixth ship, the *Nisshin,* often the leading ship, next to the *Mikasa,* received the most damage. She was hit about eight times and her turrets were damaged. A fragment of a shell struck and damaged her bridge. Three main battery guns were destroyed. About 4 p. m. a fragment of a large shell which exploded on the forward turret entered the conning-tower, wounded Admiral Misu and killed 1 officer, 3 seamen and 1 ship's writer. The wounded were 3 officers, 1 midshipman, 1 petty officer and 85 seamen. The *Tatsuda* was struck by fragments of shells, but suffered no great casualties.

BATTLE OPERATIONS OF THE SECOND DIVISION

FIRST PHASE

The *Izumo* (flagship of Admiral Kamimura, second fleet), the *Azuma, Tokiwa, Yakumo, Asama, Iwate* (flagship of Admiral Shimimura), under the command of Admiral Kamimura, with the *Chihaya* and the fifth destroyer flotilla to starboard, followed in wake of the first division. At 2.05 p. m. the first division in order to attack the head of the enemy's column, quickly changed course to ENE. from SW. by S. When fire was opened the second division at 2.09 p. m. changed course slightly to starboard, keeping distance with the first division, and after several minutes changed course to port. At 2.15 p. m. the *Izumo,* at a range of 8000 meters opened fire on the fifth ship, the *Oslabaya.* The second ship, the *Azuma,* at 6000 meters, concentrated on the first ship, the *Suvorov.* The third ship, the *Tokiwa,* at 2.17 p. m., at a range of 5500 meters,

opened fire on the *Oslabaya*. The fourth ship, the *Yakumo*, at 2.22 p. m., at a range of 5400 meters, fired on the *Oslabaya*. The fifth ship, the *Asama*, at about 2.20 p. m. opened fire. The sixth ship, the *Iwate*, at 6000 meters, fired upon the *Nikolai I*. At 2.20 p. m. following the first division, course was changed to ENE. The range becoming shorter, hitting was more accurate, each ship changing her target as the circumstances warranted. At 2.26 p. m. the *Oslabaya* and *Navarin* were discovered to be on fire. At 2.35 p. m. the *Suvorov* appeared on the starboard beam of the *Izumo* at a range of 5000 meters, and becoming a good target, the fire was concentrated on her. As a consequence this ship took fire, and black smoke enveloping her hull, aiming became difficult. At this point the second division shifted their fire to the second and third ships. The range now was from 4000 to 4500 yards and the hits made by exploding shells could be easily distinguished. At 2.50 p. m. the *Oslabaya* withdrew from the line. The formation of the enemy was becoming gradually confused and the Japanese ships were more or less damaged. At 2.27 p. m. the steering gear of the *Asama* became jammed by being struck by a large shell and she withdrew from the line. About 2.58 p. m. the first division changed course eight points to port, and the second division was about to follow when they discovered that the leading unit of the enemy seemed about to change course to starboard, and in order to cut off their escape to the southward, the second division ceased this movement and, increasing their speed, passed astern of the first division, which was now on line abreast, headed towards the enemy and opened fire on the leading ship at a range of about 3000 meters. At this time a great many of the enemy's ships were afire, and under cover of the black smoke they gradually changed their course to starboard. The enemy had become more and more confused. At 3.10 p. m. the *Oslabaya* listed to starboard and sank. The second division on course southeast crossing ahead of the enemy forced them to change course to starboard, the range becoming greater, and at 3.10 p. m. the second division countermarched to port and opened up with their port batteries. The despatch boat *Chihaya* of this division, which had, since the opening of the engagement, followed the *Iwate*, the rear ship, opened fire at 2.20 p. m. At 2.25 p. m. taking advantage of the enemy's confusion, she drew near them and at 3.06 p. m. discharged two torpedoes at the *Borodino*, which was 2500 meters distant on her starboard beam.

SECOND PHASE

The second division (the *Asama* had not yet returned to the line), about 3.10 p. m. made a change of front of 16 points to port and about 3.16 p. m. set course about WNW. and closed on the enemy who were running north in a confused condition, and at 3.20 p. m. they opened fire with their port batteries. At this time the enemy's fleet was situated a little forward of the port beam of the second division. The distance was about 6000 meters but at 3.26 p. m., closing to a range of 3100 meters, they increased the fire. The enemy was in a confused condition and it was discovered that the leading battleship was listed to port. The mist becoming dense, and mingling with the smoke, made the enemy's whereabouts unknown. As it was difficult to distinguish their own ships, the second division for a time reduced their fire, but being guided by the flags flying at the mastheads, kept up a slight fire. About 3.34 p. m. the *Suvorov* appeared suddenly from out of the mist enveloped in flames and smoke. The second division attacked her at a range of about 2000 meters and the *Yakumo* also fired one torpedo. The *Suvorov* was greatly damaged. Her masts, stacks, bridges and all articles on the upper deck were entirely destroyed and she seemed to have lost her fighting power, occasionally firing her after small caliber guns only. At this time the second division ceased firing. The fifth destroyer flotilla now taking up the fight under a severe fire from the enemy's main fleet attacked the *Suvorov*. The *Chihaya*, which previous to this had followed the second division and was standing off northwest, discovering the *Suvorov's* inability to move, at 3.39 p. m., at a range of about 1600 meters, discharged two torpedoes and observed smoke and pillars of water alongside of that ship. The *Chihaya*, being struck by three shells, took water in her coal bunkers, and she was forced to leave the line to make temporary repairs (this ship joined the second division after sunset). The enemy's main fleet which had been lost in the smoke and mist, seemed to have escaped to the northward by crossing astern of the second division. The first division, which had been cruising WSW., went about and the second division, at 3.47 p. m., changing course to starboard, took position on the port bow of the first division. Both divisions then pursued the enemy on a northeast course (at this time they came across the *Suvorov* on the starboard hand, but did not attack her). At 4.02 p. m. the distance of the enemy's main fleet, which was on the

starboard bow, was about 5000 meters. The second division opening fire, gradually changed course to starboard, and with the first division planned to draw near and cover the enemy. The enemy at this point seemed to change course to the southward and at 4.30 p. m. they were again lost to sight. The second division changed course to starboard and at 4.35 p. m. changed course to southeast, and at 4.42 again changed course to southwest. The range not only became greater, but the first division standing to the northward, it was feared that the divisions would become separated; therefore at 4.47 p. m. the second division, turning to starboard, ran northwest with the intention of joining the first division. At this time gun-fire was heard to the southward, and knowing that part of the enemy's fleet was in that direction, the first division changed their course to the southward, and the courses of the two divisions crossed. The second division changed to starboard and cruised south. About 5 p. m., by direction of the commander-in-chief, Admiral Togo, the second division took position ahead of the first division, on the port bow, and together they ran south, being guided by the sound of the gun-fire. After a short time they discovered one or two of the enemy's ships dimly outlined in the mist ahead. Standing toward them, they discovered them to be special service ships, but on account of the severe firing on the starboard bow, Admiral Kamimura knew that the Japanese cruisers were engaged, and without engaging these two ships he separated his command from the first division, stood quickly towards the direction from which the sound of firing came, and discovered the third and fourth Japanese divisions engaged with a unit of the enemy. The second division, at a range of 7000 meters, opened fire. At this time the fifth and sixth divisions happened on the scene. When the range became about 5700 yards, the enemy again changed course to starboard and attempted to escape to the westward. At 5.31 p. m. the second division, at a point about 7 sea miles southeast of Okinoshima, changed course to about WNW. and vigorously pursued the enemy. The *Asama*, which had previously left the line, returned at 5.05 p. m. and became the rear ship engaged in the fight. Previous to this the *Asama*, at 2.34 p. m. finished the repairs to her steering gear and followed after her companion ships at full speed, but owing to the mist she lost sight of the first and second divisions and became isolated. Receiving the concentrated fire of the enemy's ships, she was for a

time in great danger. Later the first division happened along steaming in line ahead in inverse order. At 3.15 p. m. the *Asama*, taking position at the head of the column, engaged in the first division's movements. At 3.50 p. m. she discovered the second division on the port bow. At once increasing her speed she passed on the lee side of the first division, and set out to join the second division, but on account of the damage she had previously received aft she made considerable water and her stern settled about 5 feet. Her after stack having been struck by a shell, greatly impaired the draft and her fires would not burn well. At 5.05 p. m., however, she was able to join the second division. By about 6 p. m. the enemy's fleet had been scattered in all directions. The second division pursued for a while, but as the range became greater and darkness came on, and not wishing to lose the first division, at 6.03 p. m. they ceased firing and cruised to port.

THIRD PHASE

The second division, which ceased to pursue the enemy at 6.03 p. m., turned to port and at 6.07 p. m. changed course to about ESE., when they discovered the sixth division closing in on the *Suvorov* and the repair ship *Kamchatka*, which were on the port bow, and in order not to hinder the movement, at 6.15 p. m. they headed north to join the first division. About 6.30 p. m., in a position about 11000 meters to starboard they picked up several of the enemy's ships with the *Nakhimov* in the rear. These ships were standing to the southward, being pursued by the first division. The second division changed course to about northwest and discovered that the first division had opened fire. At 6.40 p. m. again changing course to NE., they opened fire at 6.50 p. m., when the range had decreased to 7500 yards. The enemy again changing course to the northward, the second division, in order to keep in touch, executed a turn of 4 points to port at 7.04 p. m., and again turning 4 points to starboard at 7.10 p. m., returned to line ahead. At 7.15 p. m. they set course NNW., and at a distance of 7000 or 8000 meters opened up a slow fire on the enemy. Previous to this at about 7 p. m. the second division discovered on the port beam a battleship which was bottom up (this was said to be the *Alexander III*), and a ship of the *Zhemsthug* type went alongside of the above ship. The second division fired on her and she escaped. As the sun had entirely set the second division finished this day's

engagement at 7.30 p. m., and having ordered the torpedo craft to attack, followed the first division, which was ahead. In this day's engagement the flagship *Izumo* received seven or eight shots. The ship's hull and upper decks were damaged. Killed: 3 seamen. Wounded: 1 midshipman, 1 yeoman and 25 seamen. The *Azuma*, the second ship, was struck more than 10 times. Her hull was pierced, and one main battery gun and several small caliber guns were destroyed; also a casemate was demolished. Killed: 10 seamen, 1 officer. Wounded: 1 midshipman, 1 petty officer, 27 seamen. The *Tokiwa*, the third ship, received nine hits, but as they were only small caliber shells or fragments of larger shells, the damage was not great. Killed: 1 seaman. Wounded: 14 seamen. The *Yakumo*, the fourth ship, received about seven hits. The upper deck was greatly damaged and one stack and the foremast were pierced. Killed: 3 seamen. Wounded: 9 seamen. The *Asama*, the fifth ship, while repairing her steering gear, received a severe fire from the enemy and was struck nine times. A large shell striking below the water line damaged the captain's cabin and several storerooms in the vicinity of it and she made much water. Killed: 3 seamen. Wounded: 1 carpenter and 12 seamen. The *Iwate*, the sixth ship, through a hole in her hull, made water which rose to about 2 feet in the compartments. In addition to this she was hit 16 times. The captain's cabin was greatly damaged and her stacks were pierced, but there was no loss of life. 1 carpenter, 12 seamen and 2 yeomen were wounded. The despatch boat *Chihaya* was hit three times, and although she made some water, no great damage was done. 4 seamen were slightly wounded.

THE BATTLE OPERATIONS OF THE THIRD DIVISION

The *Kasagi* (flagship), *Chitose*, *Otowa*, *Niitaka*, of the third division, under command of Admiral Dewa, in the early morning of May 27 were to the northwestward of Shirase, when they received report of the appearance of the enemy. At 10.42 a. m. the enemy's fleet was discovered 15 sea miles south of Kinzaki, and keeping in touch with them, and having them 4 or 5 sea miles on the starboard beam, they steamed north through the Eastern Channel. At 11.40 a. m. the range was 8000 meters and at 11.42 a.m. the enemy opened fire, which was at once answered by the Japanese ships. As the range of the enemy's guns was effective the third division for a time withdrew from the fire zone. Keeping a

distance of about 9000 meters by increasing or decreasing the speed, they closely watched the enemy's ships. At about 1.20 p. m. the third division observed the first and second divisions appear from out the mist in the northeast. These two divisions took charge of the operations and the third division, passing astern of the enemy, stood to the northward. At this time the first destroyer flotilla joined the third division, but on account of the weather Admiral Dewa ordered this flotilla to operate independently. The third division at 2.10 p. m., increasing speed, cruised outside of the first and second divisions and placed themselves astern of the enemy. At 2.50 p. m. the *Kasagi*, at a range of 7000 meters, opened fire on the cruisers *Oleg, Aurora, Dmitri Donskoi, Admiral Nakhimov* and the special service ships. The *Chitose* at 2.55 p. m., the *Otowa* at 3.07 p. m., the *Niitaka* at 3.18 p. m., all at an estimated range of 8000 meters, opened fire. On account of the high seas the movements of the ships were greatly hampered. Especially when steaming into the head seas, the was coming aboard prevented the operation of the bow guns. The crews of the guns engaged were forced to wear rain clothes. The third division by this time had crossed astern of the enemy's ships to their starboard side. Joining with the fourth division cruising on a course parallel with the enemy at a range of about 5000 meters, they continued the fight. At this time the enemy's cruisers took position on the starboard quarter of the main line of battleships. The converted cruisers and special service ships seemed to follow the cruiser division. After firing for a short while the rear units, especially the special service ships, became greatly confused. Some became unmanageable and others took fire. The *Oleg, Aurora*, and the *Donskoi*, in order to aid them, changed course, and for a time ran to the westward. Hereupon the third division commanded the front of these ships and in order not to hinder the movements of the main fleet, which was operating to the northward, at 3.35 p. m. turning their bows 18 points to starboard, opened fire with their starboard batteries on the *Oleg* and the others and caused them to take fire. At high speed, circling the enemy, about 4.07 p. m., they again ran to the eastward, and took up the fire with their port batteries. The enemy's formation was now greatly disorganized. The repair ship *Kamchatka* seemed to be sinking. One converted cruiser of two masts and two stacks lost power to move. A special service ship with four

masts and one stack, and one converted cruiser of the *Ural* type were on fire and all the other ships appeared to be somewhat damaged. Each ship separating from the line, there was no formation visible. The third division at 4.30 p. m., decreasing their speed and uniting with the fourth division, pursued the remaining ships of the enemy. The enemy's main fleet, which was running to the northeastward, suddenly came out of the mist to the northward and, covering the cruisers and special service ships, opened fire on the third and fourth divisions. Both these divisions were more or less damaged, and therefore increasing speed, they changed course four points to starboard and headed east about 5 p. m. At 5.08 p. m. again making the same movement, they formed line ahead and cruised north. The first and second divisions, cruising south in pursuit of the main strength of the enemy, passed between the third and fourth divisions and their opponents. The third division at 5.25 p. m. changed course to southeast and followed the first and second divisions. Previous to this the *Kasagi,* the flagship of the third division, at about 3.08 p. m. was struck below the water line and a shell entered the coal bunkers. Making water rapidly the boiler room was flooded and the fires were extinguished. Admiral Dewa shifted his flag to the *Chitose* and at 6 p. m. disbanded his division and ordered the *Otowa* and *Niitaka* to report for temporary duty to Admiral Uryu of the second division, and the *Kasagi* and *Chitose* to leave the line. As the *Kasagi's* condition became dangerous, Admiral Dewa on the *Kasagi,* convoyed by the *Chitose,* at 6.20 p. m. left the scene of battle and at 8.30 p. m. arrived at Aburadani Bay. At 9.50 p. m., flying his flag on the *Chitose,* he returned to the scene of battle (the *Kasagi* joined at 11 a. m. the 28th). The injury to the *Kasagi* was in a port coal bunker 12 feet below the water line, and on account of its location the leak was difficult to stop. In addition to the above injury the *Kasagi* was struck in several other places. 1 seaman was killed and 1 surgeon and 8 seamen were wounded. The second ship, the *Chitose,* was hit twice. 1 gun was destroyed and 2 men were killed and 4 wounded. The *Otowa,* the third ship, received no damage but the *Niitaka,* the fourth ship, was hit once before joining the fourth division and 1 seaman was killed and 4 wounded.

THE BATTLE OPERATIONS OF THE FOURTH DIVISION

The *Naniwa* (flagship), the *Takachiho*, *Akashi*, and *Tsushima*, led by Admiral Uryu, on the morning of May 27, receiving the report of the enemy's appearance, left Chinkai Bay. Operating at first with the first and second divisions, at 1.30 p. m. they separated from the first and second divisions when the enemy was discovered in the mist in the southwest. Then changing course to port they steamed north, and at 2.10 p. m. again changed course to northeast, intending to join the third division and to co-operate with them. At this time the leading ship of the enemy was about 8000 meters to port. Fire was opened and at 2.25 p. m. course was changed to south. The *Naniwa* at 2.50 p. m., at an estimated range of 6500 meters, opened fire on the enemy's cruiser division. The other ships followed as follows: The *Takachiho* at 2.47 p. m., at a range of 6000 meters; the *Akashi* at 3.10 p. m., at a range of 6000 meters; the *Tsushima* at 3.08 p. m., at a range of 6200 meters. From now on this division, taking position inboard of the third division, worked in unison with that division. Discovering a ship of the *Aurora* type at a range estimated to be between 4000 and 6000 meters, they drove her off. Gradually on courses from southeast to east, they passed astern of the enemy and continued the attack. At 3.10 p. m. the fourth division was to starboard of the enemy's cruiser line on a parallel course. At a distance of about 5000 meters on the port bow several destroyers of the enemy were discovered, which were driven off. At about this time the special service ships which brought up the rear were thrown in great confusion by the fire of the third and fourth divisions. The *Oleg*, *Aurora* and several other ships went to their aid. At 3.28 p. m. the *Oleg* and other ships were forced to change course by the Japanese fire at a range of 4000 meters. At about 3.38 p. m. the fourth division, turning to starboard, stood to the westward and with their port batteries delivered a slow fire against the enemy's cruiser division. During this time the Japanese ships were often hit. The second ship, the *Takachiho*, on account of jammed steering gear, was forced to leave the line and head to the southward. At 4.10 p. m. the remaining three ships, the *Naniwa*, *Akashi* and *Tsushima*, changing course to the east, opened fire with their port batteries. At about 4.30 p. m. they discovered an isolated special service ship (though to be the *Rus*), and cruising to within 8000 meters of her, inflicted great damage on her. From then, esti-

mating the range from 4000 to 5000 meters, they concentrated their fire upon the enemy's cruisers and converted cruisers, especially the *Oleg*, *Izumrud* and the special service ship *Irtish*. At 4.50 p. m. course was changed to northeast but the severe fire from several of the enemy's ships, at a range of 4000 meters, caused more or less consternation. These ships of the enemy which had come from the north, were of the Russian main fleet. The fourth division then at 5 p. m. changed course and again at 5.10 p. m. to northeast and avoided the fire. At this time, meeting the second division which was in pursuit of the enemy, the fourth division followed the movements of the second division. At 5.20 p. m. course was changed to the westward. Previous to this at about 5 p. m. the *Naniwa* was struck on the port quarter at the water line. Making water rapidly decreased her speed at 5.40 p. m., but after making temporary repairs she continued in pursuit of the enemy. At 6.10 p. m. the course was changed to the northward and at this time the *Otowa* and *Niitaka* temporarily joined the fourth division. The *Takachiho*, which had previously left the line, at 6.20 p. m. returned and became the rear ship following the *Niitaka*. With six ships in line ahead at 6.30 p. m., at a range of 3000 meters, fire was opened on the *Kamchatka*, which had now become greatly listed, and at the same time upon the *Suvorov*, which had lost her stacks and masts. At 6.50 p. m. they ceased firing, and cruised towards the main fleet of the enemy, but before they again became engaged the sun had already set and the operations closed. In this day's engagement the flagship *Naniwa* was struck several times. One shell caused her to leak badly, another shell pierced the upper deck, but caused no great damage. 1 officer was killed and 9 seamen were wounded. The second ship, the *Takachiho*, was struck twice. Her steering gear was jammed. 11 seamen were wounded. The *Akashi* was struck about five times. Her hull was pierced and her stacks were damaged. 3 seamen were killed and 7 wounded. The *Tsushima*, the fourth ship, was struck six times, one hit causing a leak in her compartments. The *Otowa* and the *Niitaka*, of the third division, received no damage.

THE BATTLE OPERATIONS OF THE FIFTH DIVISION

The *Itsukushima* (flagship of Admiral Kataoka), the *Chinen*, the *Matsushima*, the *Hashidate* (flagship of Admiral Taketomi), and the despatch boat *Yaeyama*, on the morning of May 27, when

they received the report of the enemy's appearance, left Ozaki Bay under the command of Admiral Kataoka. At 9.55 a. m., in company with the eleventh, sixteenth, seventeenth, eighteenth and twentieth torpedo boat flotillas, they met the enemy's fleet at a point about 7½ sea miles southeast of Kinzaki. Admiral Kataoka ordered the *Yaeyama* and the five flotillas to take shelter at Kinzaki until he made sure of the enemy's movements. The fifth division, shaping their course northeast, took up position 4 or 5 sea miles on the port bow of the enemy's fleet. While keeping contact with the enemy, he fell in with the sixth division (the *Izumi* absent) and the tenth and fifteenth torpedo boat flotillas. At this time he ordered the *Yaeyama* and the five flotillas to join. As the enemy often changed course and it was probable that they might either lose sight of the enemy or come within too close a range, the sixth division was ordered to cover the front of the enemy. It then became clear that the change of course was made for deception. The course of the enemy was approximately northeast. At 1.30 p. m. as the main fleet of the Japanese was observed to the eastward and southward, Admiral Kataoka considering the opportunity to open the engagement at hand, hoisted the battle flag at 2 p. m. and at the same time made signals to encourage the fleet, then changed course to the eastward towards the main fleet. At about 2.10 p. m. the engagement was opened. The fifth and sixth divisions were ordered by the commander-in-chief, Admiral Togo, to attack the enemy's rear. Admiral Kataoka ordered the sixth division to operate at will, while he himself cruised quickly towards the enemy's rear but was unable to discern their ships on account of the thick mist. Being guided by the flash of the gun fire he changed course many times in search of the enemy. At 3.15 p. m., about 5 sea miles ENE., he discovered the enemy's cruiser division, composed of the *Oleg*, etc. The enemy at once opened the engagement, but the Japanese refused to reply. Often changing course, at 4.10 p. m. he discovered the third, fourth and sixth divisions in the northwest. Drawing near, and changing his course from NE. to ESE., at 4.45 p. m. he was situated at a range of 8000 meters. Hereupon the *Itsukushima*, on a counter course, opened fire upon the enemy with her port batteries. The *Chinen*, the second ship, about 4.50 p. m., at a range of about 8000 meters, opened fire. The third ship, the *Matsushima*, at 5.08 p. m. opened fire at an estimated range of 7000 meters. The fourth ship, the

Hashidate, at 4.55 p. m., at an estimated range of 7000 meters, attacked a ship of the *Oleg* type. At 5.30 p. m. the fifth division ceased firing and changed course to the northeast. The third ship, the *Matsushima,* left the line because of a jammed steering gear. At this time the first and second divisions came from the northward, pursuing the enemy. The *Itsukushima* and the other ships changed course in the direction taken by the first and second division. At about 6.30 p. m. the *Kamchatka* and the battleship *Suvorov* were seen on the port bow and at 6.48, at a range of between 3500 to 4500 meters, these ships were attacked. The *Kamchatka* had a bad list to starboard and appeared to be unmanageable. Only the stump of the mizzenmast of the *Suvorov* remained above decks and the hull was almost invisible. Flames and smoke poured from her gun ports, but she continued firing with one or two of her after guns. Sheering to port and starboard, it appeared as if she were trying to escape. About 7 p. m. the *Kamchatka* listed to starboard and sank. As the *Suvorov* was still able to move, Admiral Kataoka ordered the eleventh torpedo flotilla, which happened along at this time, to attack her. The *Suvorov* sank at 7.25 p. m., at a place 13 sea miles northeast of Okinoshima. The fifth division now ceased firing and cruised north, being joined later by the *Matsushima.* The movements of the fifth division this day were of short duration compared with the other divisions; consequently the damage was very small. The *Hashidate,* the fourth ship, was struck twice and 1 midshipman and 6 seamen were wounded. On the *Matsushima* 1 seaman was slightly wounded by a fragment of a shell. The despatch boat *Yaeyama* at 9 a. m. took the duty of guiding the eleventh and other flotillas and at 10 a. m. was ordered to separate from the fifth division and to lead the flotillas to Kinzaki, but at 10.53 a. m. was again ordered to join the fleet. Increasing her speed, she cruised to join the fifth division which she joined at 1.28 p. m. From that time, leading the flotillas, she took up position on the protected side of the division. At 4.30 p. m. the tenth and fifteenth flotillas joined and at 6 p. m. all flotillas, by the order of Admiral Kataoka, were ordered to prepare for attack. At 7 p. m. the *Yaeyama,* at a range of from 3400 to 4200 meters, delivered an attack on the *Kamchatka* and *Suvorov.* At 7.08 p. m. she ceased firing and at 8.05 p. m. joined in the rear of the fifth division.

THE BATTLE OPERATIONS OF THE SIXTH DIVISION

The *Izumi*, attached to the third division, on the morning of May 27, was about 20 sea miles northwest of Shirase of the Goto group. The *Akitsushima* was 20 sea miles off the Korean coast and both ships were engaged in watching the enemy. The *Suma* (flagship), the *Chiyoda* and the torpedo craft were in Ozaki Bay. When the report of the enemy's appearance was received the division commander, Rear Admiral Togo, with the *Suma*, *Chiyoda*, and the tenth and fifteenth torpedo flotillas, left Ozaki Bay at 5.44 a. m. The *Izumi* and *Akitsushima* were ordered to rendezvous at Kinzaki. At a point 3 sea miles south of Kinzaki they joined with the fifth division and watched for the enemy. Later, following the fifth division, they stood through the East Channel. At 11.45 a. m. the shells of the enemy directed against the third division fell very close to this division, and by the command of Admiral Kataoka course was changed to the northward. At 11.15 p. m. they occupied a position 1000 meters astern of the fifth division, but at 12 minutes past noon an order was received to get in contact with the enemy, which was on the bow. At once placing themselves to starboard of the fifth division, they drew near the head of the enemy. About 2 p. m. the main fleet was observed abaft the starboard beam and course was changed to the eastward. Both the main fleets opened fire. The fifth and sixth divisions decided on an attack on the enemy's rear, but at 2.25 p. m. the sixth division received orders from Admiral Kataoka to attack the enemy's transports, which appeared to the southward. Heading towards these, they were found to be their own converted cruisers, and changing course, they were about to rejoin the fifth division when orders were received to operate at discretion. Discovering a ship of the enemy to the southward they increased speed, drew near and found it to be a hospital ship. This ship was turned over to the *Sado Maru* and the *Manshu Maru*. On account of the wind and seas the division commander, Rear Admiral Togo, feared the flotillas would hinder the movement and he ordered them to attach themselves to the *Yaeyama* and to operate with the torpedo craft of the fifth division. The *Izumi*, which had been engaged in reconnoitering the enemy since the morning, at 7.45 a. m. received an order from Division Commander Togo to proceed to the rendezvous and join the other ships of the division, but Captain Ishida, thinking that his was the only ship in contact with the enemy, determined

to continue his duty. He took a position to the southward of the enemy and continued on a parallel course. Later he received an order from Division Commander Togo to proceed to the rendezvous he drove off a ship of the *Zhemsthug* type, which seemed to be harassing the merchant ships connected with the Japanese column. At 12.40 he warned the *Doyo Maru* by signal that her course was carrying her within the enemy's lines and diverted her to the south. At 12.50 he discovered the *Kagoshima Maru*, which was carrying soldiers, on the starboard bow. As this ship was proceeding to a dangerous locality, he hoisted warning signals, but these were unheeded. After signaling her many times, with no effect, the *Izumi* drew near to hailing distance, warned her of her danger and diverted her to the southward. At 2.10 p. m. gun-fire was heard on the port bow. Shortly after, at a range of about 7000 meters, and at a point 8 sea miles WSW. of Okinoshima, the *Izumi* received a severe attack from the rear ships of the enemy and escaped to the southward. At 2.40 p. m. the *Izumi* made a threatening attack on the rear of the enemy and cut off a hospital ship from the main fleet. At 3.40 p. m. the *Izumi* joined the *Suma* and other ships to the westward of Okinoshima and became the rear ship of the division. As previously stated, the sixth division ran south for the purpose of attacking the enemy's transports. At 3.45 p. m. for the first time they discovered the fourth division and other ships engaging the enemy on the port bow. The sixth division joined for a time, but at 4.20 p. m. discovering a special service ship of the enemy, attacked and sank her at 4.35 p. m. At this time the main fleet of the enemy, running on a counter course, appeared from out of the mist, on the port bow. The cruisers *Oleg*, *Aurora*, *Vladimir Monomakh*, and *Dmitri Donskoi* were cruising on the left flank. The sixth division concentrated chiefly on the cruiser division at a range of about 5000 meters, and also fired on the battleship line at a range of 6000 to 8000 meters. The fight at this stage lasted about 30 minutes. At 5.25 p. m. the sixth division changed course to SW. in order to attack the enemy's rear; at 5.40 p. m. they stood to the northward to attack a ship of the enemy which had lost power to move, but before fire was opened, she sank at 5.51 p. m. This ship was undoubtedly the converted cruiser *Ural*. The *Kamchatka* and the *Suvorov* were drifting helplessly in the vicinity, and attacking the *Kamchatka* at 5.05 p. m., at a range estimated to be from 4000 to 6000 meters, they

later shifted the fire to the *Suvorov* at a range estimated to be from 1200 to 4000 meters. The *Kamchatka* sank at 7 p. m. The torpedo craft were ordered to attack the *Suvorov*, but as the fifth division had not yet ceased their fire and fearing that sight of the main fleet would be lost on account of gathering darkness, the division commander, Rear Admiral Togo, collected all his torpedo craft and proceeded in the direction of the main fleet. At 8 p. m. the flotillas were despatched to carry out the attack and the sixth division proceeded to the rendezvous. In the engagement of this day the sixth division suffered but little damage. The *Izumi* had 3 men killed, 7 wounded. The *Suma*, 3 men wounded. The *Chiyota* and *Akitsushima* each had two men wounded.

THE DAY ATTACK OF THE DESTROYER FLOTILLAS

The first, second, third and fifth destroyer flotillas at 6.30 a. m., May 27, one after another left Chinkai Bay. The first and third flotillas taking position on the port quarter of the first division, and the second and fifth flotillas taking position on the starboard quarter of the second division, proceeded to the vicinity of Okino-shima. At 1.50 p. m., picking up the enemy on the port bow, the first and third flotillas changed position to the protected side. At 2.30 p. m. orders were received from the commander-in-chief, Admiral Togo, for the destroyer flotillas to operate at discretion outside of battle range. From that time the first and third flotillas, about 5000 meters on the protected side of the first division, and the second and fifth on the protected side of the second division, were watching for a chance to attack. At 3 p. m., the formation of the enemy becoming disorganized, the battleship *Suvorov* left the line and was isolated. As the second division passed about 2000 meters from the *Suvorov*, the commander of the fifth destroyer flotilla deemed it a good opportunity for attack. The *Shiranubi* (flagboat of the flotilla commander), the *Murakumo*, the *Yugiri* and the *Kagero* passed ahead of the second division and ran rapidly in the direction of the *Suvorov* through the high seas. Drawing in to a distance of 400 to 800 meters on the port side of the enemy on a parallel course, each ship discharged a torpedo and apparently at least two of them hit. The four boats together then steamed out of range. During this attack the main fleet of the enemy drew near to the *Suvorov* and concentrated a heavy fire on the destroyers. The *Shiranubi* was hit twice. 4

seamen were killed and 6 wounded. The *Asagiri* (flagboat of the flotilla commander), the *Murasame*, the *Asashio* and the *Shirakumo* of the fourth flotilla, had been reconnoitering to the southward with the third division for several days, but now, on account of the strong wind and high seas, were anchored at Ozaki Bay. On the early morning of the 27th, receiving the report of the appearance of the enemy, they steamed out of the harbor, and cruised south to join the third division. At 9 a. m., discovering the enemy to the eastward, they drew near and took position about 7000 or 8000 meters on their port bow and kept in contact with them. At 9.41 a. m. they joined the fifth division south of Tsushima. At 10 a. m. they picked up the sixth division and the attached torpedo flotilla and at 11.30 a. m. fell in with the third division. At 2.10 p. m. the engagement commenced, and they again moved to a point about 1000 meters on the protected side of the third division and cruised along. At this time the second ship, the *Murasame*, received a ricochet shell in her hull and made water. Although temporary repairs were made, she was not able to make much speed. At 1.35 p. m. the third division, at a high rate of speed, stood up to windward and the fourth destroyer flotilla was not able to follow on account of the wind and waves (at this time Admiral Dewa ordered the fourth destroyer flotilla to operate singly but the command was not understood). The fourth flotilla, now separating from the third division, changed course to leeward, which placed them on the protected side of the second division. At 4.43 p. m. the despatch boat *Chihaya* brought orders for the destroyer flotilla to attack the enemy. The fourth destroyer flotilla at once headed towards the *Suvorov*, which was on fire and isolated. That ship at this time had already lost her foremast and smokestacks and was enveloped in smoke. However, she was able to steam at a speed of about 10 knots and was using one stern gun. When the *Suvorov* perceived the movement of the fourth destroyer flotilla she changed course to starboard in an endeavor to escape the torpedo attack. Hereupon the flotilla maneuvered to cut off her escape. At 5.05 p. m. the *Asagiri*, *Murasame* and *Asashio* on a parallel course at a point distant about 600 meters delivered a torpedo attack. Then the *Asagiri* and the *Murasame* made another attack on a counter course at a range of 300 meters. One torpedo appeared to strike on the port quarter of the *Suvorov*, a column of sea water rose up and the ship at once listed about 10 degrees. The rear ship, the

Asashio, also drew nearer to the enemy, but realizing her condition, did not discharge any torpedoes. The flotilla then passed out of range. During this maneuver the main fleet of the enemy, covering the *Suvorov,* concentrated a severe fire on the flotilla. The *Asagiri* was hit once, which caused her to make water, but temporary repairs were soon made. One seaman was wounded. The third destroyer flotilla, waiting for the fourth destroyer flotilla to finish the assault, was on the point of attacking the *Suvorov,* but just at that time one group of the enemy's fleet fired on the flotilla at a range of 3000 meters and the operations ceased. This group of the enemy's fleet came from out of the mist. Thus the *Suvorov,* the flagship of the enemy, having met with a severe fire from the main Japanese fleet, and an attack by the destroyer flotillas, although greatly damaged, still remained afloat. The commander of the eleventh torpedo flotilla received an order from Admiral Kataoka to attack the *Suvorov.* Torpedo-boats *No. 73* (flotilla flagboat), *No. 72, No. 74* and *No. 75* headed for the *Suvorov* and crossed her bow from starboard to port. At 7.20 p. m. approaching to about 300 meters, the four boats delivered a torpedo attack and saw at least three torpedoes hit. The *Suvorov* wrapped in black smoke and flames, turned turtle, and for a while floated bottom up, but at 7.30 p. m. her bow rising high in the air, she suddenly disappeared below the surface of the sea. Smoke, drifting over the water, was all that was visible.

THE MOVEMENTS OF THE CRUISERS AND SPECIAL SERVICE SHIPS (RUSSIAN)

The first cruiser division of Russia following in the rear of the third battleship division in the following order: The *Oleg* (the flagship of Admiral Enquist), the *Aurora, Dmitri Donskoi,* and *Vladimir Monomakh* at 1.20 p. m. on the 27th of May received an order from the commander-in-chief, Admiral Rozhestvensky, that the cruisers and special service ships would take position on the starboard side of the battleship fleet. The *Oleg* and *Aurora* leading, the *Donskoi* and *Monomakh* and the other ships increasing their speed, took the indicated position. When the engagement opened at 2.10 p. m. the flying shells often grazed the sides of the cruisers. At 2.40 p. m. the *Izumi,* appearing from the south, attacked the starboard quarter of the special service ships. The *Oleg* and *Aurora,* increasing their speed, drew near to the *Izumi*

and returned the fire. At about 2.50 p. m. the third and fourth Japanese divisions appeared. The *Oleg* and *Aurora*, cruising to meet them on a counter course, engaged them at a range estimated at 8000 meters. About 3 o'clock the Japanese divisions, crossing astern of the Russian special service ships, and coming out on the starboard hand, attacked them. The *Oleg* and *Aurora* attempted to cover these. At 3.30 p. m. the Russian main fleet was defeated by the Japanese first and second divisions. The *Oslabaya* had been sunk and the *Suvorov* greatly damaged and isolated. Admiral Enquist, in order to aid the *Suvorov*, with the *Oleg* and *Aurora* changed course to port and cruised at full speed toward her. On the way he discovered that the converted cruiser, *Ural*, had hoisted a signal of distress and that the crew were lowering the boats. He ordered the transports *Anadyr* and *Svir* to pick up the crew of the *Ural*. The *Oleg* and *Aurora* then continued towards the *Suvorov*, but at this time, seeing the Russian battle fleet drawing near the *Suvorov*, Admiral Enquist again engaged in the covering of the transport division. During this time the Russian special service ships received the concentrated fire of the Japanese third and fourth divisions. Some of the ships were afire and unmanageable. The *Donskoi* and *Monomakh*, together with the second cruiser division endeavored to cover these, but received the fire of the fifth and sixth divisions. The Russian fleet, in an irregular formation, headed northeast. About 4.30 p. m. the *Oleg* and other ships of the first cruiser division joined with the part of the Russian battle fleet which came from the northward. Being on the port bow of the battle fleet, course was changed to starboard and about 4.40 p. m. they exchanged fire with the third, fourth, fifth and sixth Japanese divisions on a counter course at a range of from 5000 to 8000 meters. Later they gradually changed course to the northwest. On this day the *Oleg* and *Aurora* received the concentrated fire of the Japanese divisions and were often set afire. The *Oleg* was hit more than 10 times. Twelve men were killed and 31 wounded. The *Aurora* had a great hole four feet long and three feet wide near the water line. The captain and 14 seamen were killed and the executive officer and 89 seamen wounded. The *Donskoi* and *Monomakh* were hit often, but the damage was slight. The *Svietlana*, *Almaz*, *Izumrud* and the *Zhemsthug* comprised the second cruiser division under the command of the captain of the *Svietlana*. The *Svietlana* and *Almaz* became the leading ships,

urth
g to
ated
ssing
n the
npted
eated
been
lmiral
urora
. On
oisted
s. He
of the
vorov,
ear the
of the
service
rd and
geable.
cruiser
of the
forma-
er ships
Russian
he port
d about
fth and
of from
e to the
concen
re. The
l and 31
nd three
nen were
ed. The
as slight.
omprised
aptain of
ng ships,

COURSES

OF THE

SHIPS OF BOTH FLEETS

DURING THE

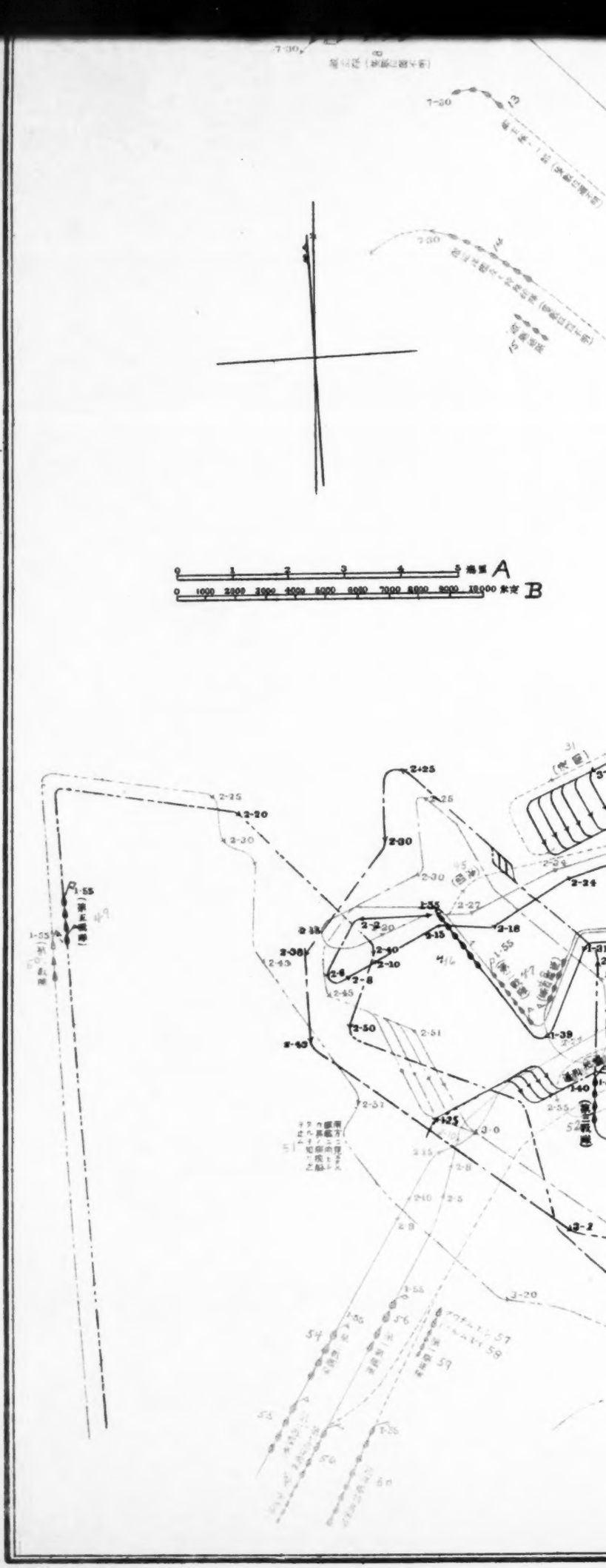
BATTLE OF THE SEA OF JAPAN

日本海海戰第壹合戰航跡圖

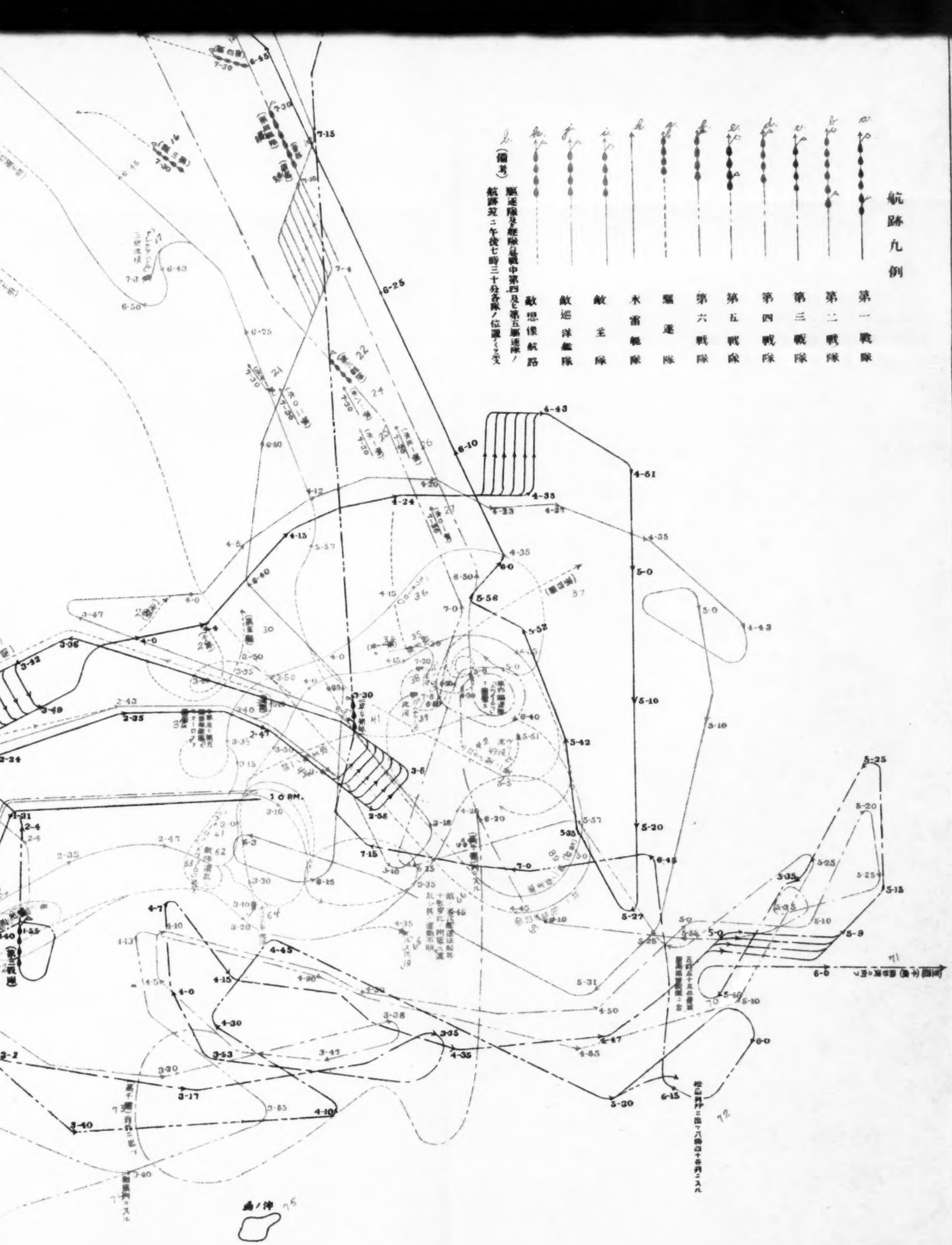
a. The 1st division (Japanese).
b. The 2nd division (Japanese).
c. The 3rd division (Japanese).
d. The 4th division (Japanese).
e. The 5th division (Japanese).
f. The 6th division (Japanese).
g. Destroyer flotilla.
h. Torpedo flotilla.
i. Russian main fleet.
j. Russian cruiser division.
k. Russian special service ships.
l. NOTE:—The 7.30 P. M., position of the 4th and 5th destroyer flotilla, only, is shown.

1. The 1st division.
2. The Tatsuda and Chihaya.
3. The 9th torpedo flotilla.
4. The 1st destroyer flotilla.
5. The 2nd destroyer flotilla.
6. Ships of enemy's cruiser division.
7. Russian destroyers.
8. Russian main fleet (position and number not clear).
9. The Borodino sinks.
10. The 5th destroyer flotilla.
11. The 2nd division.
12. The 4th destroyer flotilla.
13. Part of the Russian's main fleet (position and number not clear).
14. Russian cruiser and special service divisions.
15. Russian destroyers.
16. The 3rd destroyer flotilla.
17. The Alexander III sinks.
18. The 4th division.
19. The Otowa.
20. The Niitaka.
21. The 17th torpedo flotilla.
22. The 6th division.
23. The 20th torpedo flotilla.
24. The 18th torpedo flotilla.
25. The 1st torpedo flotilla.
26. The 15th torpedo flotilla.
27. The 10th torpedo flotilla.
28. The Asama.
29. The Chihaya.
30. The 5th destroyer flotilla.
31. The Asama.
32. The Chihaya and 5th destroyer flotilla attack the Russian ship.
33. The Asama.
34. The 11th torpedo flotilla.
35. The Russian main fleet.
36. The Suvorov.
37. The 4th destroyer flotilla.
38. The Suvorov sinks.
39. The Kamchatka sinks.
40. The 4th destroyer flotilla attacks the Suvorov.
41. The 5th division.
42. The Ural sinks.
43. The two ships of the Borodino type.
44. Part of the Russian main fleet.
45. The Asama.
46. The 1st division.
47. The 2nd division.
48. The 4th division.
49. The 5th division.
50. The 6th division.
51. The ship observed to the southward and detained was a hospital ship.
52. The 3rd division.
53. Russian cruisers.
54. Russian 2nd division.
55. Russian 3rd division.
56. Russian 1st division.
56 (a). Russian cruiser division and destroyer flotilla.
57. Russian ship.
58. Russian ship.
59. Russian destroyer flotilla.
60. Russian cruiser and special service ships.
61. The Suvorov.
62. The enemy's line in confusion.
63. The Suvorov isolated.
64. Oslabaya sinks.
65. Russ sinks.
66. Russian cruisers and transports in confusion.
67. The Takachiho enters the line.
68. Four ships of the Russian main fleet.
69. One part of the Russian cruiser fleet.
70. At 5.55 P. M., the Otowa and Niitaka joins the 4th division.
71. The Kasagi convoyed by the Chitose proceeds to Aburadani Bay.
72. The Matsushima leaves the line (returned at 8.40).
73. The Takachiho leaves the line.
74. The Izumi enters the line.
75. Okinoshima (island).

A. Sea miles.
B. Metres.



LORD, BALTD. PRESS, BALTO. MD.


航跡凡例
第一戰隊
第二戰隊
第三戰隊
第四戰隊
第五戰隊
第六戰隊
驅逐隊
水雷戰隊
敵主隊
敵巡洋艦隊
敵想像航路
(備考)
驅逐隊及ビ第二戰隊ノ戰中第四及ビ第五驅逐隊ノ
航跡ハ午後七時三十分各隊ノ位置ヲ示ス
10 RM.
沖ノ島

together with the *Ural*. The *Zhemsthug* and *Izumrud* were on the flanks. On the morning of the 27th the *Svietlana, Almaz* and *Ural* were ordered to take up position astern of the special service ships and at noon occupied this position. About 2.40 p. m. these three ships opened fire on the *Izumi*, which made a threatening movement on the starboard quarter of the special service ships. At about 3 p. m. the *Zhemsthug*, discovering the plight of the *Suvorov*, stood toward her, but was driven off by a severe fire from the Japanese ships. At 4.30 p. m. the second cruiser division, joining a part of the battle fleet which came from the northward, took position on the port side. Changing course to starboard, they joined the first cruiser division at 4.40 p. m. in an attack on the Japanese third, fourth, fifth and sixth divisions. Then gradually changing course to northwest the *Svietlana, Almaz* and *Zhemsthug* cruised on a parallel course with the first cruiser division on the port hand. The *Izumrud* dropping astern was now engaged in despatch duty. At about 7 p. m. the *Alexander III* sank. The *Izumrud* proceeded to the spot in order to pick up the crew, but was forced to give up her mission on account of the Japanese fire. At sunset following the movement of the battle fleet, all ships stood southwest. The various ships of the second cruiser division this day were somewhat damaged. The *Svietlana*, at the beginning of the fight, received a shell in the bow under the water line which caused the magazines and dynamo rooms to be flooded. The ship's head settled greatly, causing her speed to be reduced to 15 knots. The damage above the water line was slight. The *Almaz* had 5 killed (1 officer included) and 10 men wounded. The *Zhemsthug* had 12 (3 of them of warrant officer rank) killed and 22 men wounded. The *Izumrud* had 12 men wounded. The *Biedovy* and the *Buistry*, attached to the first destroyer flotilla, were close at hand to the *Zhemsthug*, which was the leading ship of the starboard column. The *Bravy* and the *Buiny* were close at hand to the *Izumrud*, leading ship of the port column. The *Grozny, Gromky, Vodry, Blestiasthy* and the *Bezupretshny* followed astern of the first cruiser division, but about noon of the 27th, when the battle formation was taken up, the first destroyer flotilla took position astern of the *Zhemsthug* on the starboard side of the battle fleet. The second destroyer flotilla took position between the first cruiser division and the special service ships. The *Biedovy* and the *Buistry* had orders to stand by and remove Admiral Rozhestvensky

and his staff to another ship in case the flagship *Suvorov* was forced to leave the battle line or became unmanageable. The *Buiny* and the *Bravy* were detailed to perform like duties in connection with the *Oslabaya,* and the boats of the second destroyer flotilla with the *Svietlana* and *Oleg*. On account of the severe Japanese fire and the continual confusion in the Russian lines, the destroyers were unable to keep their assigned positions. At 3 p. m., when the *Suvorov* left the line of battle, it was reported that there were no destroyers present, but the *Buiny* and *Bravy* seem to have been in touch with the *Oslabaya* at all times. At about 3.10 p. m. when the list of the *Oslabaya* became dangerous, the above boats ran close aboard and when she sank, under a heavy fire, engaged in picking up her crew. The *Buiny* rescued more than 200, while the *Bravy* rescued over 170, but the fire from the third and fourth Japanese divisions becoming very severe, the destroyers were forced to abandon the rescue work and join the fleet. At this time the *Bravy* was hit by a shell, which damaged her boiler and reduced her speed to about 11 knots. The killed and wounded numbered 13. About 5 p. m. the *Buiny,* discovering the *Suvorov* in flames, in a high sea stood near her and picked up Admiral Rozhestvensky and his staff, as well as 20 of the *Suvorov's* crew. This destroyer also was forced to reduce her speed on account of damages received. As Rozhestvensky was wounded, it was intended to proceed to Vladivostok. The *Buiny* at first followed the battle fleet, and meeting the destroyer *Bezupretshny,* the commanding officer of this boat was ordered by the commander of the *Buiny* to proceed to the *Nikolai I* and inform Admiral Niebogatov to proceed to Vladivostok in command of the Russian fleet. The *Buiny* and *Donskoi* later overtook the fleet and followed their movements. The *Biedovy,* which was following the *Donskoi,* was ordered by Admiral Rozhestvensky to proceed to the *Suvorov* and pick up the remainder of his staff. The *Biedovy* proceeded to carry out this order, but being unable to find the *Suvorov,* returned. The *Grozny* at about 5 p. m., discovering the converted cruiser *Ural* in a precarious condition, went alongside and picked up nine of the crew. The condition of the other destroyers was not known. However, among the nine boats, none was lost nor had become unmanageable and at sunset they appeared to be cruising after the fleet. The special service ships led by the *Anadyr,* and the *Irtish, Korea, Kamchatka, Rus, Svir* in line ahead (order not known), followed

her. With their flanks protected by the cruiser division, they followed on the starboard quarter of the battle fleet. The converted cruiser *Ural*, with the *Svietlana* and the *Almaz*, on the morning of the 27th were situated on the quarter of the special service ships. At 2.40 p. m. the special service ships were fired upon by the *Izumi* and at 2.50 p. m. received the fire of the Japanese third and fourth divisions. The fire becoming very severe at 3.30 p. m., the Russian first and second cruiser divisions endeavored to protect them. The special service ships suffered great damage. The ships attempted to escape singly. The *Rus* especially was greatly damaged, and leaving the line about 4.30 p. m., and drifting about for a while, at last sank. Her crew was picked up by the *Svir*. The converted cruiser *Ural* was damaged to such an extent that she became unmanageable and at 5.50 p. m. was sunk by the Japanese first division. Previous to this the crew abandoned the ship and more than 330 of her crew were picked up by the *Anadyr*. Others drifted to the shores of Nagato and Iwami on the 28th. (About 12 sea miles to the west of Hamada Harbor, Iwami Province, 1 officer and 22 seamen landed. In the harbor of Susa, Nagato Province, 3 officers and 30 seamen landed.) The *Kamchatka*, leaving the line at about 6 p. m., was finally sunk about 7 p. m. Fifty-six of her crew arrived at Mishima, Nagato Province, and 8 arrived at Koshigahama of the same province in small boats. The *Anadyr*, *Irtish*, *Korea* and *Svir* appeared to have suffered no damage. At sunset of the 27th they continued to follow the other ships. Previous to this the hospital ships *Orel* and *Kostroma*, at the commencement of the engagement, were several sea miles astern of the special service ships, and at 3.30 p. m. they were turned over to the Japanese converted cruisers *Sado Maru* and *Manshu Maru* and were detained in Miura Bay.

THE OPERATIONS OF THE RUSSIAN FLEET

Admiral Rozhestvensky, with the Russian fleet, intending to pass through the Korean Straits in order to go to Vladivostok, on the dawn of May 27, arrived at a point about 50 sea miles to the westward of the Goto group. This day the wind was strong and the sea was high, and on account of the mist the limit of vision was not very great. At 6.30 a. m. the *Nakhimov* discovered the scout ship *Izumi* on the starboard beam. (The Russian fleet seemed not to have been aware that they were previously discovered by the

Shinano Maru.) Moreover they knew that their formations were being reported by wireless. The Russian commander-in-chief, in order to protect the rear of the transports, caused the advanced guard ships, the *Svietlana,* the *Almaz* and *Ural,* to take positions to the rear of the above-mentioned ships. The *Ural,* which was equipped with a very powerful wireless outfit, requested permission to break in on the Japanese messages, but this permission was denied by the commander-in-chief. Without heeding the contact kept by the *Izumi,* Rozhestvensky cruised directly for the Eastern Channel. At 9 a. m. the fifth and sixth divisions of Japanese ships were discovered on the port beam and the Russians knew that the time for opening the engagement was near at hand. The *Izumrud,* the guard ship of the left flank, took position in rear of the *Zhemsthug,* the leading ship of the right flank, and was followed by the first destroyer flotilla. At 11 a. m., the Japanese third division being discovered on the port quarter, the *Vladimir Monomakh* took position to protect the right flank while the cruiser division protected the left flank of the special service ships. Rozhestvensky's orders to the fleet were as follows: If the Japanese ships appeared in the rear the battleship fleet would face these and the cruisers and special service ships would continue on the course. In accordance with this order, the first and second battleship divisions increased speed, made a general turn, 2 points to port and were about to change formation when at 11.30 a. m. they discovered the Japanese third division at a distance of about 9000 meters on the port side. The *Ushakoff* opened fire on the *Kasagi* and the other ships of the left flank followed her. The commander-in-chief, Admiral Rozhestvensky, ordered them to cease firing in order not to waste ammunition. When parallel to the southern end of Tsushima, they changed their course to north 23 degrees east. At this time the Japanese third division, accompanied by the fourth destroyer flotilla, appeared ahead of the Russian fleet and was about to cross their front. Admiral Rozhestvensky wished to attack these ships in a formation of single line abreast and the first battleship division was to make a change of front 8 points to starboard, and then by a general turning of 8 points to port make single line abreast. The *Alexander III,* at this time mistaking the movement, followed after the first ship, and the third and fourth ships followed after the second ship, and as a result the first division made, with the second division and third division, two lines

in line ahead formation. About 1 p. m. the commander-in-chief discovered the Japanese main fleet crossing from starboard to port obliquely ahead of the Russian fleet. In order to return to the battle formation he ordered the second division to follow after the first division, and the cruiser division to protect the special service ships. The first battleship division, increasing the speed to 11 knots an hour, changed course slightly to port and the second division, in order to fall in astern of the first division, decreased their speed and sheered to starboard. When the leading ship, the *Oslabaya,* was nearly in position, the flagship *Suvorov* opened fire on the *Mikasa* at 2.08 p. m. at a range of about 7000 meters. Rozhestvensky perhaps thought, when he saw the quick change to port made by the Japanese main fleet, that it was a good opportunity for attack, in spite of the fact that his formation had not yet been completed by the maneuver. The following ships then concentrated their fire on the Japanese leading units, which fire was returned about 2 minutes afterward by the Japanese ships. Both fleets at a distance of from 5000 to 6000 meters cruised on a parallel course to the northward. After a short time, the Russian fleet turning to starboard headed eastward, the *Suvorov* being abreast of the center ship of the Japanese fleet and the *Nikolai I,* the leading ship of the third fleet, almost parallel to the rear of the Japanese second division. In this way the *Suvorov* and the *Oslabaya* became the center on which the Japanese fire was concentrated. The *Oslabaya,* on account of her nearness to the Japanese fleet and also on account of her size, made an excellent target for the concentrated fire from seven or eight of the Japanese ships. One of her turrets was damaged, her mainmast and stacks destroyed and from a hole on the water line she made water. Fires broke out in many parts of the ship and dead bodies were scattered over the blood soaked deck. The *Suvorov,* next to this ship, received the most damage. Thirty minutes after the battle commenced, the condition of the Russian fleet was most unfavorable. The third division, because of inferior speed, was forced to drop astern. The Japanese first division ahead and the second division on the bow, delivered a fierce fire. A shell striking the conning tower of the *Suvorov,* caused damage to the steering gear and wounded Admiral Rozhestvensky in the head. The *Suvorov,* sheering to starboard, left the line. The *Oslabaya,* which also had left the line, was enveloped in black smoke. With a list of 15°

to port, and down by the head, at 3.10 p. m. she at last sank. Only 380 of the 900 in the crew were rescued by companion ships, it is reported. When the *Oslabaya* left the line, fire was concentrated on the other ships. The *Sissoi Veliky*, which took the place of the *Oslabaya*, was greatly damaged and for a time had to leave the line. In the first division the *Alexander III* which took the place of the *Suvorov*, received the concentrated fire of the Japanese ships and was set on fire. She left the line and her place was taken by the *Borodino*, but the formation at this time had become entirely disorganized. The captain of the *Borodino* decided to escape to the rear of the Japanese fleet. Changing course about 8 points to port, he shaped his course north, but on account of a movement of the Japanese fleet, changed his plans and swung back to his former course. About this time the *Alexander III*, extinguishing the fires which had occurred on board, reentered the line, and taking the lead, changed course to starboard and cruised south, thereby separating the first division from the Japanese fleet. The first phase at this point ended. The time was about 3.20 p. m. From that time until 4 p. m. the enemy's position was not clear, but taking advantage of the cessation of hostilities they rearranged their formation and fixed their course for Vladivostok. At 4 p. m. the Japanese first division, cruising northeast, discovered the main strength of the Russian fleet to the northeastward at a distance of about 6000 meters to starboard. Hereupon from 4.04 p. m. both fleets opened the second phase, fighting at a range of 6000 meters on parallel courses. From now on the damage to the Russian ships increased greatly. Their firing became weaker and some of the ships were in flames. The *Alexander III* was again forced out of the line and the *Borodino* again took her place. Gradually turning to starboard the Russian fleet cruised south and from 4.43 p. m. the *Alexander III* was lost in the mist. The *Suvorov*, which left the line at 3 p. m., was being handled by her engines only. From 3.20 p. m. she received the concentrated fire from the Japanese first and second divisions at a range from 2000 to 3000 meters for about 20 minutes. All her upper works were destroyed and her hull was battered out of shape. As above mentioned, the Russian ships, which had become lost in the mist, cruised south for about 30 minutes and then two ships of the *Borodino* type seemed to change course to starboard and to cruise north. About 5 p. m. on a counter course they exchanged fire with the Japanese first division for a short time. One part of the

Russian fleet, thought to be the third division, at 4.50 p. m. joined the cruiser division, which was cruising from the west, pressed by the Japanese third division. On a counter course these ships engaged the third, fourth, fifth and sixth Japanese divisions and inflicted considerable damage to the Japanese ships. At 5.05 p. m. they changed course to the northwestward. The Russian fleet, now taking advantage of a cessation of fire for about 30 minutes, collected the various units; the *Orel, Nikolai I, Appraxin, Seniavin, Alexander III, Ushakoff, Navarin, Sissoi Veliky* and the *Nakhimov*, forming line ahead, the *Borodino* leading with the cruiser division and the special service ships on the port side, they shaped their course for Vladivostok. About 6 p. m. the Japanese first division suddenly appeared on the starboard quarter and opened fire, the Russian ships changing course to about NNW. and running parallel to the Japanese fleet on their starboard side. Thus the third phase opened. The *Borodino* and the *Orel*, which were in the lead, received the concentrated fire. The hull of the *Borodino* was wrapped in flames, and as almost all her commissioned officers were killed or wounded, there was no one to direct the movements of the ship. The *Alexander III* left the line about 7 p. m. When that ship left the line, other ships seemed to follow her. One unit, with the *Nakhimov* as the rear ship, changed course with the intention of escaping to the southward but this move was not executed. At this time the sun had set, but the firing had not yet ceased. The fire on the *Borodino* was very great. The flames reflected upon the evening skies and with the second great explosion she sank beneath the waves. About 5.30 p. m. the *Buiny* picked up Admiral Rozhestvensky and about 200 of the crew of the *Oslabaya*. Admiral Rozhestvensky was in a semi-conscious state. His head and feet were severely injured. When questioned by his staff as to what orders he wished carried out, he replied, "Niebogatov," "Vladivostok," "North 23° E.," etc. His chief-of-staff, surmising his wishes, sent word by the *Brezupretshny* to Admiral Niebogatov, on board the *Nikolai I*, that the command had been handed over to him. The *Buiny* then followed and overtook the cruiser division. The *Brezupretshny* at once overtook the *Nikolai I* and sent her message, turning over the command to Niebogatov.* The *Suvorov* was again attacked after Rozhestven-

*According to Niebogatov's statement before the naval court martial at Cronstadt he received the order to proceed to Vladivostok but did not receive any order to take the command.

sky was removed and fought for a time with one small caliber stern gun, but at 7.20 p. m. she sank. During this engagement the Russian Navy lost four of the five latest type ships which formed the backbone of the Russian fleet. The *Orel* only remained, and she suffered considerable damage. The third division, composed of the *Nikolai I, Seniavin, Appraxin,* and the *Ushakoff,* led by Admiral Niebogatov, at the opening of the first phase had dropped astern, but joined again at the close of the second phase. At 7 p. m. Admiral Niebogatov made signal which read, " Follow me, course N. 23° E." Heading for Vladivostok, they were pressed on the starboard side by the Japanese fleet, and course was changed to NW. At 7.20 p. m., freeing themselves from the Japanese fleet, they were about to resume course to the northeastward when they encountered the Japanese destroyer and torpedo-boat flotillas, and changing course to SW., escaped in the darkness.

ATTACK BY THE DESTROYER AND TORPEDO-BOAT FLOTILLAS

The enemy's fleet was entirely defeated in the engagement from 2 p. m. to 7.30 p. m. on the 27th. The commander-in-chief, Admiral Rozhestvensky, had been severely wounded, and the command was passed over to Admiral Niebogatov. Four new ships of the enemy had been destroyed and the remaining ships were badly damaged. Admiral Niebogatov at sunset, collecting the scattered ships, and attempting to cruise to the northward, was forced by the Japanese fleet to change course to the northwestward. At this time the Japanese torpedo craft gradually drew near the enemy. At 7.30 p. m. the first destroyer flotilla which had been during the day on the protected side of the first division, crossed the bow of that division and at 7.30 p. m. were north of the enemy's fleet. The second destroyer flotilla during the day were on the protected side of the second division, and at about 6 p. m. they cruised to the northward of the enemy's fleet. The ninth torpedo flotilla in the morning, for a time, entered Miura Bay, and departing about 2 p. m., overtook the fleet at 6 p. m., and again separating from their division took position north of the enemy. All together commanded the enemy's front in the northward. The third destroyer flotilla, which during the day were on the protected side of the first division, at 5 p. m. made an unsuccessful attack on the *Suvorov;* then working singly they discovered the enemy about 7 p. m. on the port bow to the northeastward. The fourth destroyer

flotilla at 5 p. m., after having attacked the *Suvorov*, fell in astern of the second division and cruised to the westward. The fifth destroyer flotilla at about 3.50 p. m. attacked the *Suvorov* and then joined the second division. Together these ships operated against the enemy's flank from the eastward. The first torpedo flotilla (these boats were engaged in reconnoitering), departing from the eastern Bay of Kinzaki at 6.30 p. m. joined the fifth division and cruised northwest. The tenth torpedo flotilla during the day followed the sixth division and at 6.50 p. m. they were ordered by Rear Admiral Togo to attack the *Suvorov*, but as the eleventh torpedo flotilla was already engaged in that duty, the tenth ceased the movement. Separating from the sixth division they proceeded north. The fifteenth torpedo flotilla during the day followed the sixth division, but later cruised towards the enemy. The seventeenth flotilla, on the morning of the 27th, followed the fifth division. After leaving Ozaki Bay under the lead of the *Yaeyama* they separated from that division. At 7 p. m., separating from the *Yaeyama*, they headed for the enemy. The eighteenth flotilla on the morning of the 27th left Takeshiki and falling in with the fifth division, steamed along with it. Afterwards, separating from that division, they cruised after the *Yaeyama*. At 6.50 p. m., separating from the *Yaeyama*, they headed towards the enemy. The twentieth flotilla operations were the same as those of the 18th. These ships intended to attack the enemy's rear from the southward. All together they surrounded the enemy on three sides. The sun had set and darkness covered the sea. The wind had slightly abated, but the sea was high. The roll of the boats was from 50° to 60°. The compasses on account of this had become useless and the telescopes, being soaked in sea water, could not be used. The first division at this time had withdrawn and changed course to the northward. The enemy's fleet, knowing of the presence of the torpedo craft ahead, and wishing to avoid them, changed course to port and stood to the southwestward. About 8 p. m., when it became dark, Admiral Niebogatov changed course to north 23° east. The *Nikolai I* leading, was followed by the *Orel, Appraxin, Seniavin*, and separated by a short interval these ships were followed by the *Ushakoff, Navarin, Sissoi Veliky* and *Nakhimov;* the *Izumrud* was on the starboard beam of the *Nikolai I*. All were headed for Vladivostok and were steaming at a speed of about 12 knots. The Japanese torpedo craft, which

had been waiting for the chance to attack, now approached from three directions. Some of the enemy's ships using their searchlights made it easy for the Japanese torpedo craft to pick them up. The *Oboro* (flotilla flagboat), *Ikazuchi, Inazuma* and *Akebono*, of the second destroyer flotilla, which were now north of the enemy's fleet, at 8 p. m. stood towards the leading ship of the enemy. The enemy concentrated fire on this flotilla and shells dropped around them like hailstones, but the Japanese flotilla drew nearer and at 8.10 p. m., running on a counter course the *Oboro* discharged a torpedo at a range of between 500 and 600 meters, being followed by the other three ships. The second ship, the *Ikazuchi*, received damage to her main steampipe which greatly reduced her speed. Coming within the searchlight rays of the enemy, she received their concentrated fire. Three of her stacks were pierced and 2 officers, 1 artificer engineer, 1 petty officer, and 9 seamen were wounded. After being under the enemy's fire for about 8 minutes she passed out of range. This destroyer proceeded alone to Takeshiki. The third ship, the *Inazuma*, was struck by two shells, but received only slight damage. After the attack the *Inazuma* drew near the *Ikazuchi*, and being informed by that ship that she could proceed under her own power, the *Inazuma* left her. The fourth ship, the *Akebono*, seeing the steam issuing from the *Ikazuchi*, attempted to take her in tow, but losing each other, the *Akebono* joined the *Oboro* and *Inazuma*. At this time the *Oboro* had 1 yeoman killed, 1 doctor and 4 seamen wounded. The *Akebono* had 1 petty officer and 3 seamen wounded. This was the first attack of the night. The *Harusame* (flotilla flagboat), *Fubuki, Ariake, Arare* and *Akatsuki* (the former Russian destroyer, *Rieziastchy* which was captured at Chefoo) of the first destroyer flotilla, which was also to the northward of the enemy, closed on the enemy following the second destroyer flotilla. The commander of the flotilla ordered the second section (the *Ariake* and *Arare*) and the third section (the *Akatsuki*) to operate singly, and he himself with the first section (the *Harusame* and *Fubuki*) advanced at full speed. About 8.40 p. m., when the chance to make the attack was almost at hand, the *Harusame* collided with the *Yugiri* of the fifth destroyer flotilla and a hole about 1 meter long and 900 millimeters wide was made at the water line. The *Fubuki* also, in avoiding a collision with a torpedo-boat, became separated from the *Harusame*. From that time both boats operat-

ing singly searched for the enemy, but did not succeed in finding them. The *Harusame* then proceeded to Takeshiki for repairs and the *Fubuki* fell in with the converted cruiser *Shinano Maru*. The *Akatsuki*, of the third section, having collided with torpedo-boat *No. 69* of the first torpedo flotilla, received damages along the water line and filled her second compartment. As the attack was finished she arrived at Takeshiki the next morning. The *Ariake* and the *Arare* only of the second division came in contact with the enemy. At 9.08 p. m. they attacked the enemy at a range between 300 and 500 meters, then finishing the attack, proceeded to Utsuryo Island. In this attack the *Arare* had 1 seaman wounded. The *Shinonome* (flotilla flagboat), the *Usugumo*, the *Kasumi* and the *Sazanami*, of the third destroyer flotilla, came in contact at 8 p. m. with the main fleet of the enemy, but as the enemy changed course to southwest the third destroyer flotilla passed astern of the enemy and coming out on the starboard side, took the same course. At 8.40 p. m. the enemy was observed to the eastward. Wishing to cross ahead of the enemy's fleet to the port side in order to make a counter course attack they changed course to the southward. At 9.02 p. m. the *Shinonome*, running west by north, attacked the enemy on a parallel course to starboard at a range of 500 meters. The second ship, the *Usugumo*, barely escaped collision with a ship of the enemy, and then taking a parallel course with this ship, under a heavy fire from the machine guns, she discharged a torpedo at a range of between 200 and 400 yards. The third ship, the *Kasumi*, followed the *Usugumo*, and, although she was struck three times, she was able to discharge a torpedo at a range of 300 meters. The rear ship, the *Sazanami*, attacked the enemy alone at a range of 400 meters and then proceeded to Urusan. At this place she met the three other boats. The *Usugumo* had 1 seaman wounded. The *Shiranubi* (flotilla flagboat), *Murakumo*, *Yugiri* and *Kagero* of the fifth destroyer flotilla, closed in on the enemy with the third destroyer flotilla from the eastward. Shortly after sunset the boats separated from each other and operated independently. The first boat, the *Shiranubi*, at 10.30 p. m. attacked a ship of the enemy and then proceeded to Miura Bay to turn over the men who had been killed and wounded during the day's fight. The second ship, the *Murakumo*, about 8.30 p. m. received a severe fire from one of the enemy's ships, one shell lodging in the coal bunkers and starting a fire, and for a time she

went out of range. Again returning she searched for the enemy, but was unable to find them. The third ship, the *Yugiri,* at 8.30 p. m., at a range of 600 meters, delivered an attack on one of the enemy's ships. Colliding with the *Harusame* of the first destroyer flotilla, her bow was bent to starboard, and she made much water. Temporary repairs were made, but her speed did not exceed 3 knots. The next evening she entered Sasebo. The rear ship, the *Kagero,* at 8.30 p. m., at a range of 500 meters, discharged a torpedo at the enemy, then cruised to Urusan harbor. The *Asagiri* (flotilla flagboat), *Murasame, Asashio* and *Shirakumo,* of the fourth destroyer flotilla, coming from the east, attacked the enemy. As beforehand arranged, this flotilla was to await the finishing of the attacks of the other flotillas, but as the enemy often changed course, they lost contact with it. The second ship, the *Murasame,* had a bad leak which was caused during the day's engagement, and being separated from her companions, she proceeded to Takeshiki. The other three boats searched for the enemy with no success. About 2.30 a. m. on the 28th, while proceeding to Urusan harbor, they suddenly came across two of the enemy's ships and, after delivering attack, proceeded on their way. The *Aotaka,* (flotilla flagboat), *Karigane, Tsubame* and *Hato,* of the ninth torpedo flotilla, also approached the enemy,* and by the searchlights of the enemy they were able to pick them up. The first boat, the *Aotaka,* at 9.20 p. m. discharged a torpedo at the rear ship of the enemy at a range of 800 meters. The second boat, the *Karigane,* attacked the same ship. At the time of retreating the *Karigane* discovered that torpedo-boat *No. 69,* of the first flotilla, was in need of aid and attempted to tow her, but the water entering that boat rapidly, the *Karigane* knew the attempt would be useless. On account of the high seas it was difficult to come close aboard. At 10.45 p. m. *No. 69* sank, and 25 of her crew were picked up by the *Karigane.* The third boat, the *Tsubame,* about 9 p. m. lost the ships ahead of her and on a counter course with the enemy's ships at 9.10 p. m. delivered an attack alone at a range of between 400 and 500 meters. The *Hato,* also, at a range of 600 meters, delivered an attack alone. The four boats later joined at Miura Bay. The *Tsubame* had 1 seaman wounded. The first, tenth, fif-

* This flotilla, on account of the rough seas, in the morning entered Miura Bay in company with the fourteenth and nineteenth flotillas and remained in that bay until the afternoon.

teenth, seventeenth and eighteenth torpedo flotillas searched for the enemy from the southward but at sunset had not come in contact with them. Later, hearing gun-fire, they headed in that direction. Shortly after sunset the enemy, using their searchlights, betrayed their position to the flotillas. The flotillas, taking advantage of this, immediately proceeded to attack. *No. 69,* (flotilla flagboat), *No. 68, No. 70* and *No. 67* of the first flotilla, after sunset, stood to the northwestward and at 9.05 p. m. discovered the enemy on the port bow. When at a range of from 1200 to 1300 meters from the enemy *No. 69* collided with the *Akatsuki,* of the first destroyer flotilla. Her bow was bent about 3 meters to starboard and she made water rapidly. Becoming unmanageable she asked the *Karigane,* of the ninth torpedo flotilla, to tow her, but as she filled rapidly, it became apparent that she would soon sink. At 10.45 p. m., lowering her flag, she sank. The crew, with three "banzai" for the Empire, threw themselves into the sea. The commander and 25 others were picked up by the *Karigane,* but the whereabouts of 2 seamen was unknown. The commander, 1 artificer engineer and 4 seamen were wounded. The second boat, *No. 68,* about 9.10 p. m., becoming separated from the flotilla flagboat, operated alone and approaching the starboard quarter of an enemy group consisting of four ships, at 9.15 p. m. attacked one at a range of about 300 meters. Her boiler being struck by a shell, she stopped under a severe fire of the enemy, to make temporary repairs. She was struck about 30 times (small caliber shells). Her forward compartments were filled and 4 seamen were killed and 1 petty officer and 5 seamen wounded. At 10.30 p. m., having completed temporary repairs, she cruised to Takeshiki at slow speed. The third boat, *No. 70,* jammed her steering gear and lost the leading boats. Drifting about for 30 minutes, she finished the repairs and then went in search of the enemy, but being unable to find them, she proceeded to Miura Bay. The fourth boat, *No. 67,* was separated from the other boats. Alone she drew near to the starboard side of one of the enemy's ships on a counter course and at a range of between 200 and 300 meters, discharged a torpedo, then proceeded to Miura Bay. *No. 43* (flotilla flagboat), *No. 40, No. 41* and *No. 39* of the tenth torpedo flotilla, attacked the enemy from the southward. After sunset they steamed toward the enemy, guided by their searchlights. At 9.20 p. m. they discovered more than five of the enemy's ships standing northeast in an irregular column.

They then prepared for attack. At this time the attack by the Japanese torpedo craft was most severe. The enemy's ships were completely surrounded by destroyers and torpedo-boats and the danger of collision with each other was very great. *No. 43* at 9.30 p. m. drew in to a distance of about 800 meters, and was about to attack when she collided with the *Sagi*, of the fifteenth torpedo flotilla, and severely damaged her bow. Her forward compartments filled and her steering gear becoming jammed, she was unable to carry out the attack. She then returned to Takeshiki. The second boat, *No. 40*, becoming separated, running on a counter course, discharged a torpedo at a range of 500 meters, and then proceeded to Takeshiki. The third boat, *No. 41*, and the fourth boat, *No. 39*, becoming separated from the leading boats, carried out an attack and then proceeded to Takeshiki. The *Hibari* (flotilla flagboat), the *Uzura*, the *Hashitaka* and the *Sagi*, attacked the enemy from the southward on course west. About 9 p. m. they saw two or three searchlight beams on the starboard bow, and they knew that the course of the enemy was about NNE. Determining an attack on a counter course, they changed course to north gradually, intending to cross ahead of the enemy. At 9.30 p. m., discovering the enemy to port, they changed course in that direction. The *Hibari*, at 9.40 p. m., was on a counter course with the enemy, but on account of the high sea, she was forced across the enemy's line and came out on their port side. At 10.10 p. m., on a parallel course, at an estimated range of 600 meters, she delivered an attack on one ship and then proceeded to Urusan. The second boat, the *Uzura*, and the third boat, the *Hashitaka*, at 9.44 p. m., separating from the leading boat, searched for the enemy, and not being successful, cruised to Urusan. The rear boat, the *Sagi*, about 9.30 p. m. drew near the enemy but in maneuvering she collided with *No. 43*, of the tenth torpedo flotilla, and had a great hole stove in the port side of her engine room. She filled rapidly and listed to port and only by the greatest effort she kept from sinking. Steaming slowly, she arrived at the southern part of Tsushima and later entered Takeshiki. *No. 34* (flotilla flagboat), *No. 31*, *No. 32* and *No. 33*, of the seventeenth flotilla, attacked from the southward. About 8 p. m., observing searchlight beams they gradually changed course to the southward, and ran towards these lights. About 9.05 p. m. they discovered six of the enemy's ships standing to the northeastward. Crossing ahead

of the enemy, they came out on the port side, with the intention of running on a counter course, but on account of the high sea the boats did not handle properly. The flotilla commander wishing to fulfill his object by crossing through the enemy's lines, ordered the boats to follow his movements. *No. 34* cruised towards the third ship, which was displaying her searchlight. At 9.10 p. m., crossing the enemy's line at an estimated range of 250 meters, he attacked two ships at the same time. His forward boiler was struck by a shell which caused great damage on the port side. Another shell struck the forward torpedo tube and severed the rudder chain. As she became unmanageable, she received the concentrated fire of the enemy, and 7 men were killed. One officer, 2 petty officers, 8 seamen and 1 yeoman were wounded. Making water rapidly, the forward boiler room filled and the bow settled. About 10 p. m. she was met by *No. 61* and requested aid. As that ship was drawing near, the stern of *No. 34* rose suddenly, and she sank. All the crew were picked up by *No. 61*. The second ship, *No. 31*, followed *No. 34*, and at an estimated range of 600 meters, attacked the enemy. While searching for *No. 34*, at 10.20 p. m., she met *No. 35*, of the eighteenth flotilla, which had her boilers damaged, and was in need of assistance. Although she attempted to tow *No. 35*, on account of a bad leak she listed dangerously and was given up as hopeless. *No. 31*, lowering her small boats, picked up the commanding officer and 20 men and then proceeded to Takeshiki. The third ship, *No. 33*, arrived at a point between 1200 and 1300 meters on the starboard side of the enemy. Being detached from the other boats she approached the enemy's line. At 9.30 p. m., to starboard of the enemy on a counter course, at a range of 500 meters, she discharged a torpedo and then proceeded to Takeshiki. The rear ship, *No. 32*, at about 9.23 p. m., approached to within 250 meters of the enemy. One shell struck her torpedo tube and in addition she was struck several times by small caliber and machine gun shells. Later she proceeded to Takeshiki. One officer was killed and 7 seamen wounded. *No. 36* (flotilla flagboat), *No. 60*, *No. 61* and *No. 35*, of the eighteenth flotilla, attacked the enemy from the southward. At 8.15 p. m. they discovered to port a group of the enemy's ships heading north. At first, wishing to cross ahead of them, they gradually approached, but the third ship, *No. 61*, had her steering gear damaged. The other boats, coming within the zone of the enemy's

searchlights, were forced to separate. *No. 36* kept her course, and crossing ahead of the enemy, came out on the starboard hand, then on a counter course prepared to attack, but ceased operations on account of the other flotillas being on the point of opening an attack. She later proceeded to Takeshiki. *No. 36* was struck by a shell which wounded 1 officer and 3 men. The third ship, *No. 60*, when she was about to cross the enemy's bow, became separated from *No. 36*. Coming out to port of the enemy and running on a parallel course, she attacked a ship at a range of 450 meters and then proceeded to Takeshiki. The third boat, *No. 61*, having her steering gear jammed, separated from the other boats and at 10 p. m., when the repairs were completed, cruised in search of the enemy and discovered *No. 34* of the seventeenth flotilla in a sinking condition. Giving up her search she picked up the crew of *No. 34* and proceeded to Miura Bay. From this place she later proceeded to Takeshiki. The rear ship, *No. 35*, ran towards the enemy alone and under a severe fire drew so near that the men on the enemy's decks were visible. She discharged one torpedo. During this attack she was hit many times. Again attempting an attack, a shell damaged the main steampipe and the high pressure cylinder and she lost her power to move. Two seamen were killed and 2 officers and 7 seamen were wounded. Hoisting her break-down signal, she separated from the other boats; one part of her crew engaged in plugging up the leaks while the other part were engaged in shifting the torpedoes from the fixed tube to the revolving tube. Later meeting *No. 31*, of the seventeenth flotilla, she requested assistance, but on account of the high sea the tow lines broke, and she was forced to anchor. Unfortunately the anchor chain fouled the propeller of *No. 31*, which also became unmanageable, but cutting the chain and reversing her engine, she cleared the obstruction. Knowing that *No. 35* would surely sink, the crew were taken off, and with her battle flag flying *No. 35* went down. The fourteenth, sixteenth and nineteenth torpedo flotillas were sheltered in Miura Bay that day, as well as the twentieth flotilla, which, accompanying the fifth division, searched all night for the enemy, but as the enemy had extinguished all lights at 10.30 p. m., their whereabouts became unknown. As above mentioned, the torpedo attack of the Japanese craft about 9 p. m., the 27th, was a severe one. About 40 destroyers and torpedo-boats were engaged. The enemy, after the hard day's

fight, were in a deplorable condition. With no semblance of formation, each ship singly was attempting to escape. During this time the main fleet under Admiral Niebogatov at full speed ran to the northward. At midnight, when the torpedo attack ceased temporarily, only the *Orel, Seniavin, Appraxin,* and *Izumrud* could follow the *Nikolai I.* The battleship *Navarin* had sunk. The *Sissoi Veliky,* the cruiser *Admiral Nakhimov,* as well as the *Vladimir Monomakh,* were greatly damaged. (On the following day, the 28th, these three ships sank.) The damage to the Japanese ships was as follows: *No. 69,* of the first flotilla, *No. 34,* of the seventeenth, and *No. 35,* of the eighteenth, were lost. Besides that several ships had received more or less damage from gun-fire and collision.

THE CAPITULATION

At 10.15 a. m. the 28th the second fleet under Admiral Kamimura approached the enemy's fleet, which consisted of the *Nikolai I,* flagship, the *Orel,* the seacoast defence ships *Appraxin* and *Seniavin* and the cruiser *Izumrud.* At 10.34 a. m. the *Kasuga,* followed by the other ships, opened fire, but received no response from the enemy. They, instead, half-masted the battle flag, showing their intention to surrender. The Japanese representatives went to the *Nikolai I,* and meeting Admiral Niebogatov, informed him that Admiral Togo wished him and all officers to wear their swords and to report on the *Mikasa.* Admiral Niebogatov, wearing full dress, accompanied by his staff, came on deck, and addressed his crew. He told them that as he was an old man of 60 years, he cared nothing for himself, but he felt keenly for all the others, who were so young. He told them to persevere and work hard to restore the navy and work for their country. He informed them that he would take the whole responsibility of the surrender. He then proceeded to the *Mikasa* and agreed to the following terms: All ships would be handed over to the Japanese and all the crew would be captives of the Japanese. Officers would be permitted to retain their side arms. Both admirals then drank a toast to the end of the fight.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

Honorable Mention, 1914

OLD PRINCIPLES AND MODERN APPLICATIONS

By LIEUT. COMMANDER DUDLEY W. KNOX, U. S. Navy

Motto: "The combat is the real warlike activity, everything else is only its auxiliary."—CLAUSEWITZ.

So often one hears demands for a statement of rules which will prescribe, clearly and concisely, what tactical measures are desirable in various situations that may arise on the naval field of battle. It should not take more than second thought to understand both the impracticability and the undesirability of any such elementary definition; nor to become convinced that tactical success depends upon so clear a comprehension by the commissioned personnel of the underlying principles, that correct application of the latter, to any situation which may arise in action, will become almost automatic. No form of standardized "rules for tactical conduct" can ever be an efficient substitute for this type of trained personnel.

No human endeavor is more complex and less susceptible to rigid rule than battle. Fundamentally this is true because each side always has present an enemy whose chief aim is to thwart whatever effort is made against him; every move can be met by a counter-move and each counter-move by further effort to neutralize it, and so on. It is a contest in which the complexities are endless and indeterminate. To attempt the reduction of such a problem to a form of rule of thumb would seem to be the height of folly and to lead inevitably to disaster.

It is the purpose of this paper to examine some principles of naval tactics which have determined the issue of the fights of the past, and to indicate if possible their general application to the conditions of our own time, wherein fleets expanded to large proportions, and an increased number of different types of ships

composing a fleet, have added materially to the intricacies of battle on the sea.

Unfortunately records which have been preserved of naval actions previous to the sailing-ship era are so meager as to be of little use for analytical purposes, but beginning with the Dutch-English wars there follows a period continuing to the present generation which offers a rich field to the student.

As early as the 16th century developments came about looking toward the prevention of the mêlée and the blanketing of fire, which had previously been the rule in sea fights due to a very general lack of organization or of understanding of the increased power possible to obtain when the efforts of units are in some measure co-ordinated. The logical outcome of such elementary development was the general acceptance and adoption of the column (or line ahead) as the formation best suited to the needs of fleet engagements. In consequence the nature of sea fights changed from the traditional mêlée to a duel between two columns of ships; or to be more accurate, to a number of individual duels between corresponding units in two nearly parallel columns. The poverty of tactical conceptions during this period is apparent, but perhaps is not surprising in view of not only the primitive and weak weapons of the day but also the proverbial conservatism of the naval profession.

The first glimmer of broad tactical sense appearing in the British fighting instructions is found in those of the Duke of York; to wit: "None . . . . shall pursue any small number of enemy ships before the main body of the enemy shall be disabled or shall run." It is true that breaking the line came into favor for a time, but only for the purpose of getting the wind (when to leeward) of at least a part of the hostile fleet. Doubling was also recognized as advisable when superior in numbers to the enemy. The essence of the principle of concentrating on a part of the enemy was not, however, understood in the early days. Rigid adherence to formation was considered of first importance. This latter doctrine was based upon the disadvantages which had resulted previously from insufficiently regular formation, but, being inherently a defensive idea, it led to the undue preponderance of defensive impulses, which, added to the weakness of the offensive weapons, invariably caused indecisive battles. It is only fair to say, however, that the advantage of concentrating the major portion of

a fleet against an enemy fraction was considered, and by some was advocated, though it was not recognized as a basic principle. The difficulties of maneuver, the short range, and the limited area of train of the gun in those days would have made concentration of the Nelson style difficult to execute without bringing about great confusion. The known disadvantages of confusion led to an effort to crowd the enemy into confusion rather than to crush him in detail through concentration.

The century before Nelson was a period of slow development in which many tactical principles came to be recognized in theory, but except by accident were rarely applied practically. The genius of Nelson is responsible for a great acceleration in the progress of the art. He had the wisdom and the courage to shake off the fetters of tradition, to discard the column fetish and apply those almost untried principles which, though apparently sound, had never before received due consideration in the preparation of plans for battle. He seemed to understand that what mattered was the substance and not the form; that formation was a means and not an end. Empirical rules, in his keen insight, were to be followed only when applicable.

We have a great mass of evidence to show that his conclusions were reached only after years of constant study. All the more credit is due him because but for him the advancement in tactics would have been retarded for generations. The mental caliber of officers of his time precluded the possibility of bringing forth the fruit by anyone else. This is amply shown by the fact that notwithstanding his frequent illuminating talks to his subordinates continued through many years, probably the best among them, Collingwood, failed to grasp the essence of his teaching, and after his death reverted to old forms and conventions.

The tactical principles recognized, formulated and applied by Nelson are, briefly:

(a) Principal objective is the complete annihilation of the enemy's fleet. Partial annihilation is not sufficient.

(b) Time is everything; five minutes make the difference between victory and defeat.

(c) Concentration of own masses against enemy fractions, *in time*, is basic.

(d) A close and decisive action is necessary.

(e) The less maneuvering the better.

(f) Signals are useless after close action has begun.

(g) Vessels must support each other and close with the enemy.

(h) The business of the commander-in-chief is to bring the enemy to action on the initial terms most advantageous to himself, after which the issue of affairs is chiefly in the hands of those under him.

(i) It is necessary for subordinates to know the plans of the commander-in-chief.

(j) Simplicity of plan is essential to a well ordered battle.

(k) Victory must be followed up.

(l) The order of sailing should be the order of battle.

(m) The division of large fleets into squadrons, whose commanders have the full direction of their line, is necessary.

(n) Consideration of the moral qualities of the adversaries is an essential factor.

(o) "Something must be left to chance." "No captain can do far wrong who places his ship alongside that of an enemy," *i. e.*, the execution of the plan must be as circumstances dictate, subject only to the broad outlines of the general instructions.

Admiration for Nelson's tactical genius, however, should not dim recognition for his work in developing the complementary art of command. The two are inseparable in contributing to success. Attention is invited, in passing, to the manifestly close relation between command and practical tactics on the field of battle; that is, to the fact that only by the proper development and utilization of the art of command is it possible to apply tactical principles to meet the innumerable and momentary exigencies that arise during every phase of action. Perhaps if the commander-in-chief could take station in an air machine hundreds of feet above the scene, so as to get an accurate idea of the relative positions of the forces at all times and could have rapid and thoroughly reliable communication with each individual ship of his engaged fleet, the urgent necessities for detailed conduct of battle chiefly through the trained intelligence of the various subordinate commanders would be minimized. But until this is possible great success can come only by means of subordinates who are not only conversant with the letter of the principles but who are also thoroughly familiarized with every aspect of them under a great variety of conditions. Not in any sense whatever is the rule of thumb a short cut to tactical success, and the due im-

portance of properly applied principles of command in assuring decisive victory is not generally so well understood as could be wished for.

THE BATTLE OF THE TEXEL (1673)

This battle is notable chiefly for two reasons: (a) It is among the few large fleet actions in history where the moral factor was about equal on both sides. About the only other actions falling in the same category are those of the same period between the English and Dutch. (b) It was the first time that the conventional "line ahead" was used in a large sailing-ship action. The English used it there and were subsequently in later wars copied by the French, Dutch and Spanish; becoming eventually for all sea-faring a fetish.

The action also has many occurrences illustrative of tactical principles.

The opposing forces comprised about 70 Dutch ships under De Ruyter against an allied force of 60 English and 30 French. De Ruyter's general plan was to contain the French (who composed the allied van) with an inferior Dutch detachment and to engage the English on equal terms.

The French were sent ahead by the commander-in-chief of the allies to gain the wind of the inferior Dutch van and place it between two fires. While this was in progress, and the Dutch van were meantime forging ahead as a containing force to meet the move, the two centers became hotly engaged under the direct command of both commanders-in-chief. The French in the van succeeded in getting the wind, by a good margin, of the Dutch center and rear, due partly to De Ruyter running into close action; Rupert, the English commander-in-chief, keeping somewhat away, and separating himself by a considerable distance from his allies, the French.

The Dutch containing force of 12 ships found themselves "contained" by 20 French, to leeward, and boldly ran through the French van and went to the support of their commander-in-chief. This movement of the Dutch van was brilliant tactics and conformed with the following tactical principles:

(1) Avoid action with superior detachments; (2) support the point of major contact; (3) concentrate the mass of your forces

on a part of the enemy; (4) avoid detached engagements and if possible engage only with ships already under fire from friends.

The French force not only acted badly in permitting the inferior Dutch force to get through them, but afterwards committed the unpardonable blunder of not following their designated opponents and of failing to promptly support the English in the center.

Meantime the English admiral, Spragge, commanding the allied rear, showed equal poverty of tactical sense even though his valor was greater.

As a point of personal honor he wished to defeat the Dutch admiral, Tromp, and in order to bring the latter to action hove to and waited for him to come up. The English rear thus became widely separated and out of supporting distance from its main body. The separate and personal encounter that followed had no effect on the main action. This is a striking illustration of a subordinate placing his personal affairs and private glorification above the general plan of his commander-in-chief, a pernicious type of disloyalty. In addition, Spragge flagrantly and deliberately violated the principles of (1) concentration; (2) mutual support; (3) unity of action.

In the meantime the British center found opposed to it the Dutch center plus the Dutch van, and had to engage those two forces without any support from its own van or rear. De Ruyter succeeded further in applying the principle of concentration by cutting off the rear part of the English center, and containing this fraction while he surrounded the remaining 20 English ships, including the English flagship of the commander-in-chief, with 30 or 40 Dutch ships.

That the British were not badly beaten is due to the ineffectiveness of the weapons of the day. Finally the English center succeeded in getting out of close engagement and ran down, for the purpose of finding support for itself, to the detached rear under Spragge.

The Dutch followed on a parallel course, without either side firing (probably from shortage of ammunition).

Upon the junction of centers and rears, the battle was resumed, but it was then so late in the day that no decisive conclusion was reached.

The French were on the point of reenforcing the British as the battle closed.

THE BATTLE OF TRAFALGAR (1805)

The *Forces* engaged were: The allied French and Spanish fleet of 33 heavy and seven light ships under command of Admiral Villeneuve.

British fleet under Nelson consisted of 27 heavy and seven light ships.

Preliminaries.—The allies in Cadiz were watched by frigates, which vessels also formed a chain for communicating to the British fleet at sea, guarding the Strait of Gibraltar.

When first sighted the allies were out of Cadiz in column, heading about southwest, close-hauled on the starboard tack. Wind was light from about west-northwest. The British fleet was then about 15 miles to the westward (and to windward), heading about north-northwest, and in a formation of three columns separated by about one and one-half miles' interval. The line of bearing of column heads was about northwest. Nelson commanded the center with 11 ships, Collingwood the right or rear with 15 ships, and six fast light ships were on the left and comprised the van.

About 7 a. m. the allied column wore in succession and headed about north, and at the commencement of the action was in a column, with center bowed considerably away from the enemy, somewhat like a half moon.

Anticipating a concentration against his rear, Villeneuve kept his reserve squadron of seven fast sailers just out of the formation and to leeward, abreast the rear center. His column was also well closed up, and further strengthened by a second column, just to leeward and abreast the gaps of the weather column.

As a defensive formation it was excellently devised to withstand the expected form of attack which was later realized.

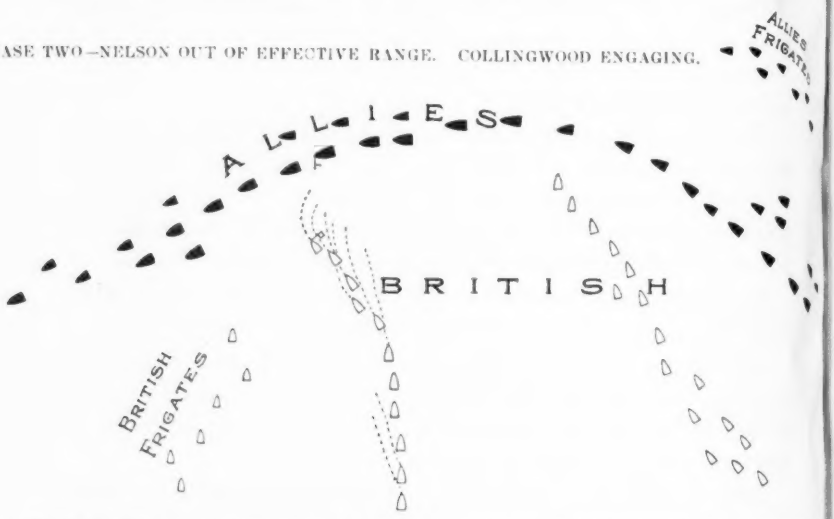
Having the French to leeward, Nelson, at about 7 a. m., signalled to bear up and the leaders of each of his three columns headed in the general direction of the enemy fleet, course about east; wind west-northwest to west.

From the initial positions given, it will be seen that a continuation of this movement would bring the three squadrons into action in succession, Collingwood first, Nelson second, and last the light squadron. Also that the ships of each squadron would come into action in succession and approximately "teed" by the allied column.

TRAFALGAR.

PHASE ONE—OUT OF RANGE.

PHASE TWO—NELSON OUT OF EFFECTIVE RANGE. COLLINGWOOD ENGAGING.



THE RELATIVE POSITIONS SHOWN ARE AN APPROXIMATE RECONCILIATION BETWEEN VARIOUS CONFLICTING AUTHORITIES.

PRINCIPLES ACCENTUATED.

I. Keep sufficiently *concentrated* to afford *mutual support*.
II. *Isolate* as much of the enemy as practicable while engaging the rest with the maximum force possible.
III. *Avoid action* unless superior at the point of threatened contact.
IV. Support the point of *major contact* in the least *time* practicable.
V. Disregard formation when the situation so demands. *Mass* is more vital to success than is *formation*.
VI. *Time* is *everything*. Defeat one part of the enemy before it can be reenforced.
VII. The exigencies of the moment outweigh the desirability for rigid adherence to the *details* of the general plan.
VIII. Minimize *maneuvering*.
IX. *Squadrons* should be maneuvered separately.
X. The *order* of *sailing* should be the order of battle.

The Plan.—Nelson had previously prepared a plan to cover the situation presented and had carefully indoctrinated his subordinates in its manner of execution.

Its salient features were:

(a) To bring the enemy to decisive action.

(b) To minimize maneuvering.

(c) Squadrons to be maneuvered separately; *i. e.,* the entire fleet as a whole was not to be brought into battle line as a whole.

(d) The order of sailing to be the order of battle.

(e) The second in command to have the entire direction of his line.

(f) No captain could be far wrong who placed his ship alongside that of an enemy.

(g) The second in command to lead through about the 12th ship from the enemy's rear and envelop the latter with 15 ships.

(h) The commander-in-chief to lead through a little ahead of the enemy's center; to include the flagship of enemy commander-in-chief.

(i) The third or fast squadron to reenforce if wanted, before action, one of the two main squadrons.

(j) In addition to "leading through" the enemy center, Nelson's squadron to "endeavor to take care that the movements of the second in command are as little interrupted as is possible."

(k) In this manner the hostile rear and center were to be overpowered with superior force *before* they could be supported by their van.

The Battle.—In accordance with the plan, and with Nelson's indoctrination, Collingwood conducted his squadron near the enemy's rear, formed a rough line of bearing to avoid the "tee" and vigorously attacked the 11 rear ships of the allies.

Nelson with his own squadron supported by the small fast squadron first "endeavored to take care" that Collingwood's movements would not be interrupted by the hostile van. These two squadrons stood for the French van as though to attack it, until Collingwood was engaged. At this point, Nelson, seeing that the enemy van or center made no move to support its rear now hotly engaged, and probably believing that insufficient time remained for the French van to effectively support its rear, changed course and stood towards a point a little in advance of the enemy center. The fast squadron remained unengaged as a containing force against the French van.

This last movement of Nelson's squadron has been severely criticized, chiefly owing to the fact that Nelson led his squadron "teed," into the allied line. Data are incomplete and there is some doubt that he did so. If the original signal to "bear up" was intended for or executed as a simultaneous movement instead of one in succession, as Mahan assumes it to be, then there was some approximation to a line of bearing attack by the squadron under Nelson's immediate command, and it did not go into action "teed." Rear Admiral Mark Kerr of the British Navy is the principal authority who supports the latter view.

The concentration on the allied rear was successful in winning a decisive action. The allied van did not support its rear, and even had it done so it is doubtful whether it would have arrived in the mêlée in *time* to have changed the outcome.

Comment.—Trafalgar is notable as being the only big fleet action in which a well digested *plan* preceded the battle. The essentials of the plan were carried out loyally by the subordinates, resulting in that rare and difficult thing, *unity of action.*

With special regard to Nelson's own movements,[1] the writer believes that they were more than justifiable, and that the only fair adverse criticism that can be made is that he was a little too impetuous. Yet is not this a desirable thing in the person of the commander-in-chief at a critical point in a big engagement? His *example* means much, psychologically, to the subordinates in his vicinity and to the morale of the enemy. The security of his person at such a stage of the fight is entirely secondary since the outcome in this respect cannot be known until the fight is won or lost.

To examine more closely what he did do:

Standing directly for the enemy fleet until just out of gun range, he changed course to almost parallel their line of bearing. This permitted his rear ships to close up and in part to form line of bearing paralleling the enemy formation.

Having the interior line and sailing free, a continuation of the maneuver would take his squadron out of supporting distance of Collingwood and would place Nelson's squadron opposite a part of the close-hauled allied line where superior forces could be concentrated against him, thus violating first principles.

[1] On the assumption that Mahan is correct and that Nelson's squadron went into action "teed."

Nelson's movement so far kept the enemy in the dark and indicated to the latter an attack on his van center; thus discouraging him from supporting his rear, and gaining time for Collingwood to drive home his superiority at the point of contact.

At this stage, while still out of effective range, Nelson changed course abruptly to about east-southeast and led his 11 ships through the enemy column six ships ahead of Collingwood. His feint prevented a timely concentration against Collingwood, and his ultimate act was nothing less than the throwing of the mass of his whole fleet against the area of the enemy center and rear.

He abandoned the fetish of "formation," sacred for so many centuries, and still sacred now so long after the event, for the sake of a more sound doctrine of using *mass* to crush a decidedly inferior enemy fraction *before* it could be supported. "Time is everything."

In this crisis Nelson acted in accordance with the following tactical principles:

(a) Support the point of major contact in the least time practicable.

(b) Keep concentrated, so as to afford mutual support.

(c) Avoid detached engagements.

(d) Isolate as much of the enemy as practicable while engaging the rest with the maximum force possible.

(e) Disregard formation when the situation so demands. Mass is more vital to success than formation is.

(f) Avoid action unless superior at the point of threatened contact.

(g) The *example* of the commander-in-chief is contagious.

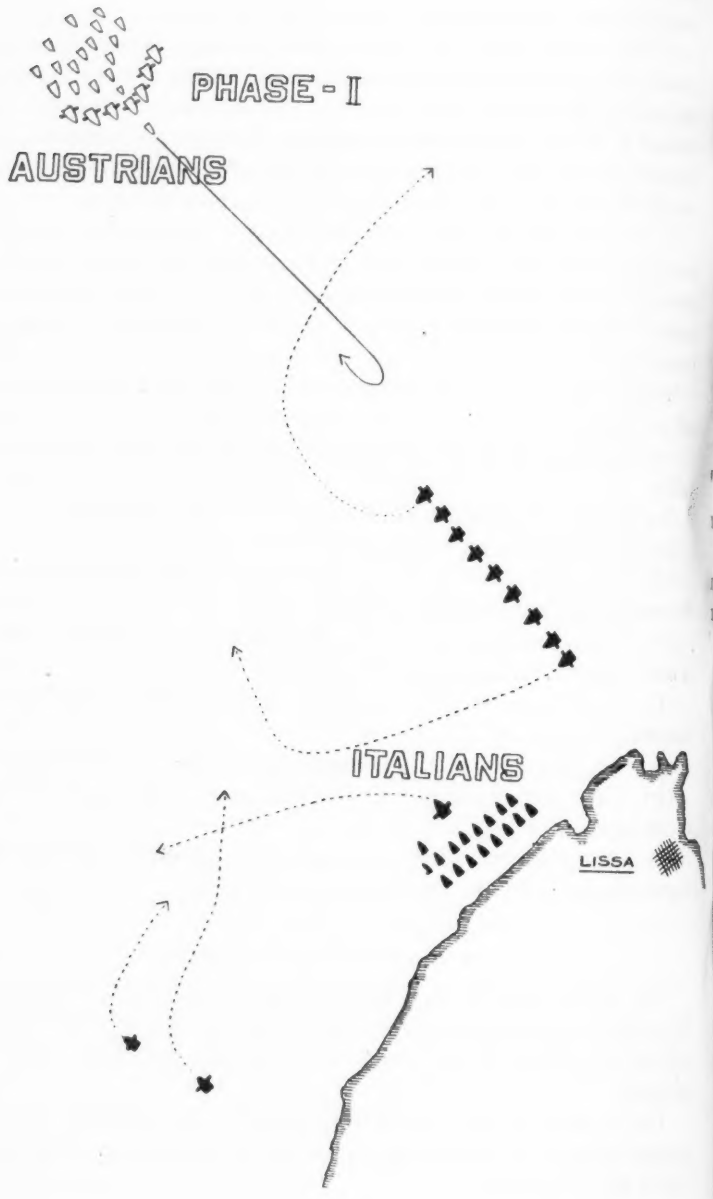
(h) Time is everything. Defeat one part of the enemy before it can be reenforced.

(i) The exigencies of the moment outweigh the desirability for rigid adherence to the details of a general plan.

THE BATTLE OF LISSA (1866)

This action was the first in which any considerable number of ironclads were opposed to each other, and the only ironclad action except Tsushima from which fleet tactical principles may be gleaned.

The Italians were considerably superior in matériel, but decidedly inferior in preparation, training, and morale to their opponents, the Austrians.


PHASE - II
AUSTRIANS
ITALIANS
LISSA

IRONCLADS –

WOODEN SHIPS –

BATTLE OF LISSA.

PRINCIPLES ACCENTUATED.

...y fleet is the principal objective.
...fleet should not be weakened by engagement with shore defences until command of the sea has been gained.
...ective *surprise* is fatal.
...ion is a necessary prelude to a victory.
...ment divided, scattered forces the best point of attack is the enemy center.
...ll forces should be brought into action as nearly *simultaneously* as possible.
...Before and during action keep *concentrated*. Employ all available means during action.
...rmation is a secondary consideration compared with the concentration of *mass* at the proper point at the critical *time*.
...ure a poor means of conducting a fleet during battle, and far inferior to that co-ordination produced by a *plan* combined with *cooperative initiative* of *trained subordinates*.
...tual support between fleet fractions is an essential requisite to successful battle.
...tive ardor of personnel is essential to victory.

The Italian admiral, Persano, was from the opening of the campaign very dilatory and showed a poverty of strategic sense as well as of combative ardor. Rather than accept the inferior Austrian fleet as his principal objective, he chose, after a long period of inactivity, to attack the Island of Lissa. Worse still, in the execution of this eccentric mission, he permitted a scattering of forces and failed to take proper precautions against surprise, so that when the Austrian fleet suddenly and unexpectedly appeared he was very illy prepared to receive it.

Two days were spent by the Italians in the vain attempt to take Lissa. Many casualties occurred among ships and men. On the third day, when first intimation of the approach of the Austrians was received, the Italian fleet was widely scattered and busily engaged in bombarding and in landing operations. Squally weather added to the plight of the Italians.

Persano had no plan, and his fleet felt the full psychological effect of a surprise. A " storm of signals sweeps over the squadron," Persano steamed confusedly about and managed in a comparatively short time to form a line of nine ironclads. After several changes of formations he finally formed a badly stretched column, about at right angles to the enemy's bearing. One armorclad signalled she could not fight, and then deserted the field, two others were too far off initially to join action. The wooden ships were signalled to form behind the ironclad line, but did not obey.

As a final touch, when the Austrian attack was imminent, Persano stopped his flagship and shifted his flag to another ship. A great gap was thus left in his already too extended column. On boarding the new flagship, Persano " commenced to race up and down the line, doing little fighting but making numerous signals." Few captains being aware of the shift of flag " and as all the ships were so dressed with flags that signals could not be distinguished, nobody paid any attention to him, and the Italian fleet was left without leader or orders " to fight in isolated units against a concentrated force ; and against captains who could see their admiral's signals and who knew his plans.

The Austrian fleet was massed ; the ironclads in the lead in a wedge formation, and the wooden ships close in rear in two wedges, paralleling the van. They hit the Italian line in the gap caused by the stopping of Persano's flagship (and 15 minutes after that event), and thus divided the Italian fleet.

It is unprofitable to follow the detailed course of the action. A mêlée ensued, the Austrians keeping concentrated in two groups, wooden ships and ironclads, and the Italians becoming worse scattered. The value of a study of Lissa is not found in the geometry of tactics but in certain broad principles which were there accentuated more through the doing of the wrong thing than the doing of the right thing. These principles may be summarized as follows:

1. Enemy fleet is the principal objective.
2. Own fleet should not be weakened by engagement with shore defences until command of the sea has been gained.
3. Effective surprise is fatal.
4. A *plan* is a necessary prelude to a successful action.
5. Against divided, scattered forces the best point of attack is the center.
6. All forces should be brought into action as nearly simultaneously as practicable.
7. Before and during action keep tactically concentrated. Employ *all* your means during action.
8. *Formation* is a secondary consideration compared with the concentration of mass at the critical point at the proper time.
9. Signals are a poor means for conducting a fleet during action and far inferior to that co-ordination produced by a plan combined with the united intelligent effort of subordinates.
10. Mutual support between fleet fractions is an essential requisite to successful battle.
11. Combative ardor of personnel is an essential to victory.

THE BATTLE OF TSUSHIMA (1905)

This action is notable because it is the only one in history where two large modern squadrons (they could hardly be termed "fleets") were seriously opposed.

The Japanese had the advantage of their generally successful campaign during the preceding year, which served as excellent training in all the factors of naval warfare, and also as a means of elevating their own morale while depressing that of the enemy.

The Russians had a decided advantage in the number and the power of their ships, but a greater disadvantage in depressed morale, woeful lack of training in tactics and gunnery, incompetent commanders, the presence of a train and in the fact of having had to make a very long passage immediately preceding the action.

The Russian fleet was sighted soon after daylight by a Japanese scout, which though seen by the Russians was permitted to keep touch without molestation. The Russian fleet continued on its northerly course and maintained cruising formation, in double column, until some time after the Japanese fleet was sighted standing on a nearly opposite course across the port bow of the Russians.

The Russians had some difficulty in understanding signals, and, consequently, with interior maneuvers.

Just before coming within range the Japanese changed course about eight points left and stood south-eastward across the heads of the two Russian columns. Here Rodjesvenski leading his eastern squadron tried to support his exposed column by obliquing to its support, but that support was given too late to save the leader of the port column which was concentrated on and sunk, the column being "teed."

Rodjesvenski's supporting movement resulted in the Japanese, merely by continuing their course, teeing his own column, and in its leader being so badly damaged as to be forced to leave the formation temporarily.

The Japanese shortly countermarched so as to hold the tee, and Russian head changed course four points right in an effort to remedy its bad position.

The Japanese again countermarched to parallel the Russians, concentrated fire on the Russian knuckle and gradually completed another tee on Russian head. The tee was kept for a considerable time by countermarching after the Russians had turned sharply to port. This decided the action.

The Japanese had available about four knots superior speed, and maneuvered by squadrons *independently, but co-ordinately,* and in accordance with a general plan. Most of their countermarches were done by squadrons maneuvering by a simultaneous movement on signal.

On account of rough seas Japanese destroyers were kept in port during the day action and only attacked at night after the enemy was badly scattered, but they used their cruisers in the line of battle.

This action emphasizes the following points:

(a) The business of logistics, while necessary, is a function entirely separate from and should be subordinated to the business of preparing for and executing the fight. A commander-in-chief

who permits his mind to be engrossed with logistics and administration is badly handicapped when it comes to fighting.

(b) Exercise in the things to be used in battle, such as signals, maneuvers, and gunnery, is necessary if the fleet is to perform them well in battle.

(c) The moral element in war is the paramount factor.

(d) Well placed cruisers in the line of battle may be as good or better than poorly placed battleships. Every available ship should be used in action.

(e) Squadrons operating with good degree of independence, and in accordance with a general plan, is a much superior method to that of attempting the maneuver of the entire fleet by means of signals from one source; particularly when in the latter case there is no prearranged plan.

(f) "The order of sailing" should be the "order of battle" when contact with the enemy is anticipated.

(g) Early information of the enemy's formation is of great value during the approach.

(h) Destroyers are probably not of much use in a fleet action when the sea is rough.

(i) Concentration of force and of gun-fire on a flank is murderous.

MODERN TACTICS—GENERAL CONSIDERATIONS.

In applying the principles of tactics to the present day, we find, that even since Tsushima there have been very great changes in types of ships, in numbers that will probably be engaged, in weapons and in auxiliary appliances. The dreadnought type of battleship, the battle cruiser, the submarine, the sea-going destroyer, the long range torpedo, the floating mine, the radio apparatus, the perfected turret appliances, fire-control apparatus, gun sights, the turbine, the hydroplane, etc.

While data concerning the performance of each of these have been obtained from practical experience with them, their proper use in action and their general influence on tactics, have been determined only on the maneuver board. This method of tactical development and of tactical indoctrination is very valuable. Only by such means are adequate mental training and frequent exercises at insignificant expense practicable. While game board rules must be founded on certain data which can be obtained only through actual practice, once these data are determined the game board is a

more accurate method of tactical analysis than is that of tactical maneuvers with ships. Let no one conclude, however, that tactical knowledge developed by the work of others on the game board or elsewhere, can be used successfully by an officer who has not by frequent game board practice trained his own mind to apply correct tactical principles with the celerity, certainty and determination that are essential to success.

The game board has two distinct functions. One is the careful and deliberate study of tactical principles, and the methods of best applying them. The other is the mental training of officers to use these principles and methods with a degree of expertness that will promise success. The latter function can only be achieved by the individual efforts of the student officers.

Consideration of our subject is simplified if accidental types are eliminated and only the pure types dealt in. These latter may be assumed to be: the battleship, the destroyer, the scout and the submarine.

Considering the operations of two large hostile fleets comprising of these various types, the realm of tactics begins long before the two main bodies reach sight contact. Commander Pratt has stated that the tactical area includes some 400 miles in advance of a fleet at daybreak, diminishing to about 200 miles at sunset. These figures are based upon the maximum distance from which the main body can support at daybreak a destroyer attack made during the preceding night. This assumes the proper time for a destroyer attack to be preceding an action, and that such attack should be followed up by main body attack before the enemy has had opportunity to recover order, formation, standard distance and morale. Togo's use of destroyers at Tsushima, though probably induced by bad weather before and during the action, that of attack of crippled ships on the night following the fleet action, is considered to be decidedly faulty. The employment of this type during a day fleet action will be considered later.

Assuming then that each fleet commander will aim to get in a destroyer attack in force on the night preceding an action, *information* of the enemy main body at a *time* when the fleets are close enough to support such attack by battleships the next day, becomes of great importance. Since the best defence against such an attack is a similar attack on the opposing main body, information of our own main body is of equal importance to the enemy whether or not he be acting defensively.

Normally then a fleet action will probably be preceded by vigorous and extensive operations by each side with a view to:

(a) Locating and delivering a night destroyer attack on the enemy main body.

(b) Denying the enemy information of the whereabouts of our own main body and the avoidance by the latter of the enemy's destroyer attack.

In these operations all pure types should be employed. The scouts should keep close touch with enemy main body, trusting to their speed to keep out of trouble. Destroyers should act on the information given by scouts as well as do some searching on their own account; deployment (preferably by small groups) is necessary during their search, followed by concentration before and during the attack. The destroyer objective is the hostile main body, so that screens encountered should be penetrated or avoided. In order to suffer minimum damage, both while penetrating screens and while attacking subsequently, the main destroyer attack should be massed near one point. The probability of the hostile fleet changing course, however, as soon as an attack in force develops and thus putting the latter astern, renders it desirable to precede the main attack by a feint or a secondary attack from an opposite direction, so that the fleet will turn into the main attack.

During the daylight preceding a destroyer attack, both sides will try to drive in the opposing destroyers. Scouts and destroyers will be employed for this purpose, and these should be supported by fast battleships. The latter should in turn be supported by submarines, which are also of use in penetrating enemy screens and obtaining information of his main body, even after the surface scouting force be driven off.

No matter what dispositions have been made for screening, a wise commander-in-chief will at night, whether or not his location is known to the enemy, disperse his battleships rather widely so as to reduce the torpedo target of the formation, and will be prepared to make a simultaneous change of course on radio signal, so as to put any attack in force that may develop astern of his main body. Two thousand yards between ships and 4000 between divisions does not seem too great a dispersion, and with a long range torpedo even wider deployment may be advisable. The least valuable battleships should be used as a last resort to screen the more

modern ships. The fact that the enemy will prefer to make his destroyer attack just preceding daylight, makes this period a very critical time because the fleet must be prepared to concentrate as day breaks in order to meet a battleship attack. Once having obtained good touch during the early night however, destroyer commanders will for fear of losing touch later on, be very loath to postpone their attack until the theoretically more perfect time—just before daylight.

THE MAIN DAY ACTION

Once having passed through the stratego-tactical period and having gotten the two fleets into sight contact by day, the functions of the various types change materially. The annihilation of the hostile fleet becomes the principal objective. The battleships' chief role is of course obvious. The gun being the main weapon of the battleship, the latter type will naturally form in a line of bearing about at right angles to the general bearing of the enemy. The types whose chief weapon is the torpedo, *i. e.*, the destroyers and the submarines, will naturally seek a position on the bow of the enemy's formation. The water in advance of the two fleets will thus become the battleground of destroyers supported by such fast and powerful types as may be available. Scouts and fast battleships will be formed there in order to control this speed area and to project from there torpedo attacks on the hostile column, as well as to protect own battleship column head from similar attacks. It should be the aim to deliver these torpedo attacks *after* the main fleets have joined action, so as to force either a decided change of course of enemy fleet under gun-fire, or an acceptance by him of the risk of torpedo damage, accompanied in either case by a diminution of fire against friendly battleships, due to enemy change of course or change of target.

The faster fleet will draw ahead, isolating the rear of the slow fleet and enveloping its head, unless the slow fleet turns away and moves on an inner circle. With submarines present they must have high surface speed if they are to be of use to a fast fleet in turning enemy head. The slow fleet on the other hand may protect its head with slower submarines moving on interior lines. The slow submarines of a fast fleet may, however, attack through its own column in safety and deliver a torpedo attack on enemy center or rear of a long column. With the advent of the long-range torpedo

this weapon will have a marked influence upon tactics. Fast battleships equipped with this torpedo may get within torpedo range at the expense of but slight gun-fire damage to themselves. The value of the submarine and the destroyer in day actions will be enormously increased; so that when this weapon comes into general use it may with reason be expected that the range at which guns will be used will be markedly increased, and in addition, the interval between ships must be increased if the chance of a torpedo which passes through the formation making a hit is to be discounted.

A torpedo hit early in the action is of so very much more value than one hitting after the damaged ship has already delivered a great part of her gun-fire, that it seems likely that effort will be made to inflict torpedo damage in the early action and before closing the range. Thus an intermediate step will be introduced between the "approach" and the deliberate general engagement at medium ranges. This may be termed the "torpedo" stage of the action and corresponds to the artillery stage ashore, and like artillery, the torpedo will be used to some extent during all stages of the battle.

It should be a good precautionary measure against a torpedo drive from ahead, as well as against a fast wing aiming to enfilade the head with gun-fire, to open out some of the leading ships of the main column several thousand yards in advance of that column.

CO-ORDINATION

During the approach and during the torpedo stage of an action when gun-fire is light, co-ordination is comparatively simple. The various units give to each other and to the commander-in-chief mutual information; and the latter may not only acquaint his subordinates with the salient features of his general plan as it develops in accordance with the information received from time to time, but also may give specific directions in regard to the movements and operations of the various detachments. As the torpedo stage develops into more general and closer contact, this frequent communication will become difficult and situations will change so rapidly that interior direction by the commander-in-chief will be impracticable. There is, then, necessity for a substitute for personal direction at that time by the commanding admiral. No other method can be sound than that of such co-ordination as may

be obtained through indoctrination preceding the action, coupled with a uniform system of command by means of which it will be well understood just what the function of each commander is to be in any undertaking that may arise. In every sea fight there will soon arise a situation in which formations will become ragged and plans confused. This will be the time when victory hangs in the balance; what has preceded will be relatively unimportant. It is for this critical stage and not for the mere introduction to an engagement that fleets should be best prepared. Then will become most apparent the very great value of properly trained subordinate commanders who are authorized and able to use that type of initiative which Von der Goltz defines as " independence, based on intelligence, which prompts an inferior to promote the ends of his leaders." Let us now examine more closely those general principles which should govern subordinate leaders under such circumstances that unity of action can be obtained.

The fundamental principle of tactics is the concentration of the mass of one's own forces against enemy fractions, at the critical time and place. This is easily understood as a principle, but its application is more difficult. From this principle and from the foregoing historical analyses may be deduced certain doctrines for the conduct of ships, divisions and squadrons in a fleet action.

(1) Keep sufficiently concentrated to ensure mutual support.

(2) Endeavor to get all forces into action simultaneously.

(3) Support the point of major contact in the least practicable time.

(4) Avoid detached engagements.

(5) Avoid action with enemy forces not already under fire, and if possible isolate them from action.

(6) Avoid action unless superior at the point of threatened contact.

(7) Fast wing and destroyers avoid action till main body engages.

(8) Use individual initiative without signal where necessary to (a) further the general plan; (b) take advantage of a position gained; (c) to recover from a disadvantage.

THE TIME ELEMENT

Before a proper conception of naval tactics is possible, the value of time must be thoroughly appreciated. Nelson has said that time is everything and that five minutes may mean the difference between victory and defeat. This is as true to-day as in his age. Farragut said: "The best defence against the enemy's fire is a well directed fire from our own guns," and in this saying lies the essence of the time factor to-day. A slight superiority of gun-fire will in a few minutes become a great superiority.

The damage done by our first salvo lessens the effectiveness of the enemy's succeeding salvo. Our subsequent damage is correspondingly slight and our fire effect proportionately greater, thereby still further weakening the enemy fire. And so on; by this cumulative process any initial superiority is rapidly increased and becomes tremendously greater at the end.

It is this time element which makes it so inadvisable to tell off a reserve force at sea, except in the sense in which Nelson used a reserve; *i. e.*, as a force to join a designated squadron *before* the fight; the battle will otherwise probably be lost before a reserve can get into action. This time factor also makes a containing force inadvisable to use; particularly when operating on interior lines. Better by far to get the containing force at the point of major contact for a few minutes in advance of the force that would otherwise be contained; it will thus serve a more useful purpose toward winning the fight. An exception to this may be made where submarines are available for use as a containing force or where inferior speed prevents getting the containing force into action.

THE PLAN

A commander-in-chief who would go into action without a well considered and clearly formulated general plan would be grossly culpable. Not only must such plan be clearly understood by himself and staff, but it must be imparted to all principal subordinates in order that they may co-ordinate their efforts among themselves and with the commander-in-chief himself, to the end that unity of action may be obtained. As a basic principle of co-ordination and unity of action, "loyalty to the plan" of the commander-in-chief by all participants is absolutely essential.

Such plan must be firmly based on rudimentary tactical principles and should follow the lines along which indoctrination has previously followed. The battlefield is no place to introduce tactical novelties. United action is very difficult under the best conditions and impossible in battle except on terms entirely familiar to all the participants. In this connection it may be noted that one of the chief sources of a high morale is *self-confidence* which is born of familiarity with the task in hand, and this fact is one of the greatest arguments for previous training in games and fleet exercises. Doctrine, which is essential to the successful execution of any battle plan, cannot be otherwise established during peace coincidently with conviction of its soundness, and doctrine without general conviction is an empty form which will not survive the stress of battle.

The very simplest plan will involve more friction in its execution under fire than is desirable. Simplicity of plan is then an essential to success. It may be remarked also that the plan should not go far into details; it must be very general and indicate only the principal intentions.

The unlimited discretion of the enemy precludes any possibility of carrying out a plan which projects much beyond the first few operations after the battle opens. The plan then is merely an introduction to the fight.

Finally the plan must aim at the best use of the means at hand considered in connection with the means to be met, *i. e.*, the enemy fleet. Every available means, every type of ship, and all ships, must be utilized to the limit of their capability or else the plan cannot be an acceptable one. The slightest factor may mean the difference between victory and defeat.

FORMATION AND MOVEMENT

The general arrangement of types on the battlefield has been previously sketched, and the fact noted that the two fleets will normally take up positions on general lines of bearing approximately parallel to each other. As a rule the two fleets will move in the same general direction and at the best speed which each can maintain.

Formation is of course merely a means and not in itself an end to be attained. At all stages of the action the formation should primarily conform to the best compliance which the general situa-

tion will allow with the fundamental tactical rule of concentrating the major portion of one's own forces against weaker parts of the enemy. In practice this will mean, as has been already pointed out, that engagement should be refused, or only accepted at great ranges, except when superior in force at the point of contact, and that detachments must keep within supporting distance of each other. It will also mean ordinarily that full broadsides should be brought to bear on the enemy, and that when superior at a point of contact the range should be reduced as much as practicable. The resulting formation normally then will be a concentrated fleet in an approximate "column" or "line ahead," but broken as the enemy's formation and movements make necessary or as they furnish opportunities for pushing an advantage. Of course, too, these general considerations may be frequently modified in practice in order to accomplish some special momentary objective such as the execution of a particular part of a general plan. Nelson at Trafalgar, for example, accepted the transitory handicap of exposing the leading ships of each column to greatly superior fire in order to carry out the general plan of concentrating his entire fleet on the hostile center and rear.

Many believe in the pure column formation on the ground that it is the best formation from which gun-fire may be delivered. Certainly the best manner for the employment of all of our weapons should be adopted, and since the gun is the primary weapon it should be given preference in selecting the formation to be used. But certainly also this reason alone is inadequate for the adoption of any unchangeable formation. It is hardly likely that a wide-awake enemy will get close enough to all parts of a fleet in one long column to permit the collective broadside to be used in such an ideal manner. If he does not do so we must be prepared to go after him or protect ourselves in such other formation as the occasion demands. No fleet can afford to be the slave of any formation, which in principle is but a tool to be used in the manner most advantageous to its master. Our fleet must learn to be a skilled master of this tool.

Another advantage frequently claimed for the column is that it is the formation most likely to minimize confusion incident to position keeping and to poor co-ordination. This is perhaps true if it be admitted that a fleet of 30 or 40 heavy ships can maintain position in single column. The writer once witnessed an effort

of 19 well trained battleships to cruise in column, in time of peace with bridge stations occupied and instruments in use. It resulted in surprising failure and was abandoned within about half an hour. The last six or eight ships had a bad time of it, and incidentally their frequent great changes in speed would have played havoc with gun-fire. Nelson's judgment that a fleet of 40 large ships could not with profit be brought into battle as a unit and should be subdivided into partially separated and somewhat independent squadrons is as sound to-day as it was in his time. It is indeed a confession of weakness if we admit at the start our inability to learn to properly co-ordinate the detachments of a fleet so divided. The writer cannot concur in the latter premise and therefore does not believe we should limit our choice of battle formation to one which is clearly weak and dangerous.

The lack of homogeneousness in most fleets introduces the problem of the proper order of ships in the formation. Many believe that dreadnoughts should be concentrated at one end; others that they should be concentrated in the center. In the latter case both flanks would be left weak and the dreadnought speed could not be used to advantage. In the former case one flank is weak, the dreadnoughts will separate from the slower ships and the slow ships probably will not get into action against a faster fleet. Placing dreadnoughts in the lead should be good against a fleet of inferior speed, since in such case all ships could certainly get into action. With own fleet of inferior speed, placing the slowest ships in the center, dividing faster ships on each side of them and putting half the dreadnoughts on each flank might be advantageous. Here the formation would remain concentrated and the fast ships utilize their extra speed in preserving the line of bearing perpendicular to the bearing of the enemy. The resulting movement would be a wheel about a movable center, preferably by division columns. One would thus accept the defensive but would have to submit to it anyway due to inferior speed, unless of course the fast ships alone were superior in force to the enemy fleet, in which event the concentration of speedy types which permits taking the offensive would be more advisable.

Movement in general under fire is better done by division columns than in any other manner. Simultaneous movements of single ships are no doubt impracticable not only on account of signal friction, but also because of risk of collision. Division

column movements require well trained division commanders who will take the initiative promptly whenever the situation demands, without trepidation for the responsibility assumed. Divisions of three ships better serve the division column tactics than do those of four ships.

Any radical change of course greatly disturbs a ship's gun-fire, so that course should, if possible be changed only a little at a time. For the same reason if the enemy can be forced to turn abruptly while he is under fire, for example, by a destroyer of fast wing drive on his head, a decided advantage will have been gained over him.

WIND

In days gone by the weather gage gave to its possessor the choice of fighting or of avoiding action, and for that reason was of great value.

Recent experience with gun practice has developed the fact that funnel smoke and powder gas interference is decidedly disadvantageous to gun-fire, and for that reason the lee gage is generally considered preferable notwithstanding the other handicaps of spray from the sea and from enemy shorts, and of spotters having to face the wind. Perhaps further experience and other considerations may modify opinions in this respect.

It seems possible, for example, that the heavy funnel smoke-cloud normally emitted by a large fleet steaming at high speed, may, under certain conditions of range, wind and atmosphere, operate to obscure a part of the lee fleet to such an extent as will prevent the efficient use of its guns, and permit the weather fleet to concentrate its entire gun-fire upon that fraction of the lee fleet which offers a good target. Such a condition of affairs would be almost as good a "concentration of mass" against enemy fractions as could be desired.

TORPEDOES

Frequent comment has been made above with reference to the use of destroyers and submarines, which need not be repeated.

In the use of the torpedo in general, the most advanced conception is that the formation rather than the individual ship should be considered as the target. In the column formation the chance of hitting by torpedoes passing through the formation is the ratio

between the length of the ships and the open water between. With other formations the chance of hitting varies greatly with the position of the firing ship in respect to the formation.

There is considerable doubt in the writer's mind as to whether destroyers can be used to better advantage by day or by night. If the hostile battleships are unprotected by their own destroyers or other screening force, an attack by night could scarcely be resisted, and is unquestionably justifiable. On the other hand, where a screen must be pierced before the battleships can be reached, there is some reason to believe that the destroyers had best be saved for the day action on the morrow. This is particularly true if the enemy has superiority in destroyers. The losses incident to screen piercing will usually be great. Further losses will come from battleship fire after penetrating the screen and in greater degree than if the screen had not been present to warn the battleships and enable them to maneuver to place the attack astern. Those boats not badly damaged will fire torpedoes at widely scattered targets and the percentage of hits will necessarily be small. There will be few torpedoes remaining to take part in the day action.

By day, on the other hand, the enemy will be in sight, his course and approximate speed known, and his formation concentrated giving a good target. The fire sustained by day will be relatively small if the attack is well supported and takes place while the enemy main body is under gun-fire. He may shift all his battery to the attacking destroyers but to do so he must greatly slacken fire on our own heavy ships whose fire will be correspondingly improved. If the destroyers can come in under the shelter of smoke they will not be badly damaged. The great amount of smoke made by a large fleet steaming at a speed to be expected in battle is not generally appreciated. Under certain atmospheric conditions this smoke-cloud remains close to the surface for a long time. When two big fleets are within range, good vision through sight telescopes may be very difficult.

Certainly a day attack of this sort is more in keeping with the fundamental principle of tactics—*concentrated* attack by the whole force at the critical *time* and *place*—than is the night attack. It certainly would seem to offer such chances of undermining the enemy morale, at a time of great nervous stress, that a reasonably successful destroyer attack then would win the fight.

The effectiveness of destroyers is greatly enhanced by using them *en masse*. The failure of the Japanese to do this instead of using the boats individually in their war with Russia, has since been concluded by the Japanese General Staff to be the principal cause for their poor success.

Torpedoes furnish the only weapon of the submarine. Inasmuch as a position forward of the target beam is greatly preferable to one abaft of it, it follows that submarines should have sufficient speed to place themselves in the desired position. So great speed under water being impracticable, it follows that high surface speed is the only solution that offers. Without such speed the usefulness of this torpedo carrier is reduced to that incident to stealth and to pure chance; except where the use of interior lines is practicable. At night the efficiency of submarines is reduced owing to their vulnerability at that time—for during darkness the periscope is valueless and the boats must operate in an awash condition, thus falling an easy prey to destroyers or even to picket launches. When used in conjunction with destroyers or in a night attack it seems bad in principle to have the submarines accompany the destroyers. A probable better use is to separate them so that the submarines will be in position to intercept ships turning away from the destroyer attack.

The new type of large submarines fitted with heavy oil engines makes a craft of long radius capable of accompanying the fleet at sea and introduces a new factor in sea fleet actions. Their influence no doubt will be to make both fleets wary during the approach period, but in the end one fleet must accept the hazard boldly and endeavor to break through the cordon believed to be surrounding the fleet on the defensive. Once inside this cordon the submarine's danger is greatly reduced, though never wholly eliminated. In the defence of bases and the guarding of passages the submarine is an extremely valuable auxiliary to which there is no satisfactory answer. The best reply seems to be in a superiority of surface torpedo craft and in speed. In one sense the submarine may be regarded as a movable mine field.

The Russo-Japanese War brought the mine very much to the fore, both as a defensive and an offensive weapon. The defensive carrier can be any type of vessel. One of special type is preferable. For offensive uses the best type is one possessing speed, thus supplying the factor of mobility which the mine itself lacks.

Occasionally the battleship may have opportunity to use mines in an offensive sense, notably when retreating preliminary to an attack. Owing to this danger as well as to that of the submarine, fleets will no doubt in future be deterred from following a retreating foe which has not already been badly punished or is not greatly inferior, and even then the opponents' wake will be avoided if practicable. Owing to their speed, seagoing qualities and diminutive size, the offensive mine carrier par excellence is the destroyer. Those vessels equipped with floating mines will be very dangerous both by night and day. A destroyer attack following mine damage will be very effective, particularly at night, and by day as well if properly supported. No weapon has a greater influence on the enemy's nerve than this unseen one. Success in its use would create all the well known advantages of surprise and would cause the enemy grave confusion and loss of morale by both men and officers.

The introduction of the floating, as well as of other types of mines, renders necessary constant sweeping operations in advance of a fleet underway. Means for efficient sweeping should be greatly perfected.

Finally it seems probable that attacks on the underwater body of ships will be a very deciding factor in the next war. Structural design to minimize the damage from this form of attack is an imperative necessity.

MORALE

Of all the many factors entering into tactics, as well as into the other branches of war, the moral one is pre-eminent. Without moral force "the material is worth no more than old iron."

The field battle is primarily a contest of will and character.

Victory comes to those who, regardless of the balance of material force, longest and most stubbornly keep alive their will to conquer and their conviction of ultimate success.

Once the confidence of strength and the belief of victory is badly shaken, the battle is lost. "Battle, from its nature, exacts of man a superhuman effort that strains all the fibers of his organism; and this abnormal tension can only be produced and maintained by the hope of victory. As soon as that disappears, the reaction at once sets in, and the worn-out man gives up."

In planning and executing all his battles, Napoleon's chief aim was to shatter the enemy's morale. In his ability to do so lay the greatest secret of his success. It is well to profit by his example and to formulate our own plans with the same end in view, and to direct every detail with the principal object of undermining the enemy's morale. Surprise him, throw him into confusion, and before he has had opportunity to recover, throw the mass of one's forces into the critical area. The prompt following up of a real advantage or even of a situation which to the enemy only *appears* disadvantageous, is one of the best means of lowering his morale and making him believe that his case is hopeless.

High morale springs primarily from self-confidence, and this in turn is derived from knowledge of or belief in one's skill and strength, as compared with the enemy. Familiarity, then, with war operations gained by frequent practice during peace constitutes a great element of moral strength. Another is the assurance of the timely and adequate mutual support of our fellow fighters, and still another is conviction of the soundness of the doctrine which uniformly guides our side.

In modern fleet actions the range will be so great as to prevent true appreciation of the damage which is being done to the enemy, our own damage being meanwhile subject to undue exaggeration and concern. This fact makes it more than ever necessary exhaustively to study the subject of morale and its allied subject of psychology.

The spotter, the range-finder operator, and the gun pointer who are afraid or unduly agitated will begin the disintegration of our forces through lowering the efficiency of our fire and consequently raising that of the enemy.

We must study *man* and particularly the American man, with a view to developing in our officers and our crews *now*, during *peace*, such moral qualities as will sustain us in action, through the pre-combat stage when the enemy is approaching and nerves are at the breaking point; through the punishment stage when men act mechanically and habit and discipline only may sustain them against the fundamental instinct of self-preservation; and through the disintegration stage when the fabric of our mental systems begins to go to pieces. Character and will, alone, then stand between defeat and victory.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE DEVELOPMENT OF OUR NAVY'S SMOKELESS POWDER

By Lieut. Commander Ralph Earle, U. S. Navy

The Proceedings of the Naval Institute contain the very best and most valuable professional works on all subjects, and the writer in submitting this plain story of our smokeless powder hopes that it may find a place in our service publication. That it may interest many officers and place on record before the service the development of our present powder before the progress and the men responsible for it are forgotten is the *raison d' être* of this article. The names of many of the men connected with this development are not generally known to the service but the navy is justly proud of their work and should give due credit to them by acknowledging and placing their achievements in our Proceedings. The building by the navy of one of the finest powder plants in the world without a single accident to its employees or product is surely a feat for the navy to be proud of. Compare our results with those obtained in France and we see how high we stand, for there M. Vielle, the French chemist and the inventor of nitrocellulose powder, probably the greatest explosive chemist in the world, although in charge of the government plants, has yet seen two fearful disasters take place in his navy, both of which were due to improperly manufactured powder.

Most of us do not know the men who have placed our navy in its powder manufacture on such a high plane. We do know that the French disasters occurred because their government factories were controlled entirely politically, so much so that not even an officer's inspection of the manufacture was allowed, and yet no one who has been acquainted with their service and their naval officers can have the slightest doubt that, if the same opportunity had been afforded them, the results would have equalled ours.

The adverse criticisms of our powder that appear frequently in various publications have never yet been based on fact or expert knowledge, there has always been some ulterior motive in them or some axe to grind. The record of our powder speaks for itself and whatever may be said of it by foreign critics—one can hardly call them disinterested either—it is *not* and never has been similar to Poudre B[1] of the French with which it is continually and very erroneously being compared to its detriment.[2] We do not claim the powder was as good at the start as it is now, for improvements in the manufacturing methods and chemical structure of it are continuing daily.

If we exclude Greek fire, which by an addition of saltpeter was made explosive at a very early and uncertain date, there existed from the 14th century to the 18th century but one explosive, black powder.[3] M. Bertholet, a French chemist, toward the end of the 18th century made the first steps towards a new explosive when he prepared potassium chlorate and endeavored to apply its extraordinary oxidizing property in the manufacture of explosives; but his researches yielded no results and ended on account of severe explosions.[4] Next came investigations upon the actions of concentrated nitric acid on starch, wood, cotton, and other organic compounds; the most prominent men in this field—which, however, bore no real results—were Braconnet, Pelouse and Dumas.

Detonators and percussion caps were developed through the discovery of mercury fulminate by Howard in the year 1799. This substance has the chemical formula $Hg(CNO)_2$ and is prepared by a solution of mercury in nitric acid being treated with alcohol. The manufacture of fulminates was taken up by Liebig and Gay Lussac, and the compound was used as early as 1815 by an English gun maker, Joseph Egg, as caps for small firearms.

[1] See U. S. NAVAL INSTITUTE PROCEEDINGS, Vol. 37, No. 140, p. 1281, for detailed comparison of powders.

[2] See U. S. NAVAL INSTITUTE PROCEEDINGS, Vol. 38, No. 141, p. 133, for a detailed answer to the most common criticisms.

[3] Black powder is still extensively used in certain types of blasting work and has a large sale for sporting powders, it being much cheaper than smokeless. Its accepted composition to-day is 74 per cent saltpeter, 15.6 per cent charcoal, 10.3 per cent sulphur; the moisture in the powder after drying generally remains at least .6 per cent.

[4] For much of the data in this article I am indebted to a lecture given by Prof. W. Will some years ago.

Between 1840 and 1850 occurred the investigation that revolutionized the explosive industry, and resulted in the discovery of nitrocellulose by Christian Friedrich Schonbein, and the preparation of nitroglycerine by Ascanio Sobrero at Turin.

C. F. Schonbein, in Basel, discovered in 1846 in his experiments on the oxidizing effect of sulphuric and nitric acid, the fact that, when cotton is dipped in such a mixture, a remarkable reaction takes place, wherein the outer appearance of the cotton has not been at all changed. It shows the same appearance, the same structure as before dipping in the acid mixture, but its chemical properties are entirely changed. The substance previously so tame, has suddenly become an eminently explosive compound.

Prof. R. Bottcher, who had also discovered an explosive cotton while engaged in similar experiments at Frankfort am Main, joined with Schonbein on October 5, 1846, and published the process for the preparation of guncotton. In other words Schonbein is the discoverer of nitrocellulose. Soon guncotton was tested in England at Woolwich Arsenal, under the influence of F. Abel, and its manufacture on a large scale was undertaken by the firm of John Hall & Sons at Faversham; and scientific experiments took place by a special commission of the German confederation to which, among others, the Austrian lieutenant, von Lenk, belonged, and which was assisted by Liebig as scientific expert. Large rewards were promised in case guncotton should show itself a substitute for black powder.

The English investigations ended suddenly in 1847 in consequence of the explosion of the still unfinished factory at Faversham. In 1848 there also occurred in France big explosions at Le Bouchet and Vincennes, terrible reminders that one must not underestimate the dangers which were involved in the manufacture of the new explosive.

The Austrian government bought the process from the discoverers and continued experiments in Vienna Neustadt under von Lenk. He improved the manufacture in many respects. He boiled the cotton, previously spun into yarn for more ease in handling, with potash solution for complete removal of the fat, he introduced a very thorough washing of the nitrated product in running water lasting several weeks, then treated it with a warm soap solution, and finally moistened it with water glass (sodium silicate) solution. This was to increase its stability through the alkali carbonate

formed by contact with the air, and to give a denser, more slowly burning nitrocellulose through an inclusion of incombustible silica in the pores.

Lenk's cotton enjoyed a reputation for some time of being a sufficiently stable product, so that in the beginning of the '60's nothing appeared to hinder a general application of guncotton. But the overcoming of the other difficulties, especially in its ballistic application, proved greater than had formerly been supposed. The guncotton burned so rapidly in the barrels that the weapons were damaged or burst.

In spite of many a preliminary treatment by spinning the nitrated fibers into strings and cords, the combustion could not be controlled in the necessary way. So, when in 1862 the explosion of a guncotton magazine in Siemering Heath occurred, and in 1865 the explosion of a second magazine on the Steinfelder Heath, near Vienna Neustadt, both of which were ascribed to a spontaneous ignition of the guncotton, the manufacture of guncotton came to an end also in Austria.

But, in the meantime in England, under Frederic Abel's supervision, experiments were carried on diligently. Abel came to the conclusion that the objections which had led to giving up the work on the continent were exaggerated and that the unfavorable judgment in regard to the stability of Lenk's cotton was not justified. He carried out similar experiments to Lenk's and found that such purified guncotton answered all necessary demands in regard to stability. He improved methods for controlling the velocity of the explosion by pulping the nitrocellulose thoroughly in a pulping machine and then compressing it under great pressure.

This pulping process formed the key to the solution of the manufacture of stable guncotton, and *thus modern guncotton really dates from the year 1865.* Abel also introduced the granulation of the pasty mass with a small amount of binding substance in a vessel with swinging motion, and in 1865 he protected by patents the use of a mixture of soluble and insoluble nitrocellulose with the addition of solvents such as ether alcohol as a binding agent for the preparation of solid, that is, gelatinized, masses. It is unknown whether he carried out the process at this time.

In order to use this new explosive it was necessary to develop primers and fuses to ignite it and thus obtain the benefit of its properties. Their development came about indirectly through the

discovery of nitroglycerine by A. Sobrero, of Turin, in the year 1846. This substance is the product of the action of nitric and sulphuric acids on glycerine.[5] Immediately on the discovery of this compound he noted the terrible explosive effects on striking or heating it.

Nitroglycerine had been known for 20 years without other than a medicinal application until about 1860, when A. Nobel, of Stockholm, began his experiments in applying its energy for explosive purposes. He was engaged in developing a good blasting material. In 1864 he had tried to increase the effect of the simple fuse by a slight addition, that of an initial charge of quickly burning black powder. He finally, in 1867, found the solution by using mercury fulminate igniting caps for detonating nitroglycerine. He was the first one to show that this substance can detonate other substances.

It was this discovery of Nobel's which released for use in blasting, and other explosive uses, a whole series of explosive compounds.

It is said that A. Nobel by accident hit upon the mixture known as dynamite. He was shipping nitroglycerine in sheet iron canisters, which, to be protected from shock or blow, were packed in a bed of kieselguhr. One of these packages leaked and the nitroglycerine oozed out into the kieselguhr. This attracted Nobel's attention to the remarkable absorptive power of this earth. He found that with a content of about 75 per cent nitroglycerine a plastic mass is obtained which is much less sensitive to shock or blow than nitroglycerine, and in consequence of its plastic nature is exactly fitted to the manufacture of cartridges, which can be easily fitted into drill holes. The manufacture of nitroglycerine then grew up enormously. In 1861 it was first manufactured by Nobel on a commercial basis in the vicinity of Stockholm. In 1865 A. Nobel started the famous nitroglycerine factory at Krummel on the Elbe, which is still the largest factory on the continent.

Edwin O. Brown, a co-worker with Abel, and second chemist of the English war ministry, showed soon after that Abel's guncotton products could be brought to detonation in the same way.

Besides dynamite, guncotton here came into extensive use, after Brown had shown that it would give a complete detonation even in a wet condition with an initial charge of dry guncotton.

[5] See Explosives, Brunswig, by Munroe and Kibler.

In 1866 the manufacture of nitroglycerine was prohibited by Belgium, Sweden, Denmark and England; but this prohibition was quickly repealed as the safety of dynamite began to be proved.

To show the rapidity with which dynamite became common it is instructive to state that its manufacture in 1867 was but 11 tons, while in 1874 it was 3000 tons, and that now 2,000,000 tons are made yearly.

To develop a powder for ballistic purposes was the next problem. In 1860 the English captain, Noble, introduced the crusher gage for the measurement of powder pressure. The first actual successful steps towards the development of a smokeless powder according to modern ideas were first, the invention of the E. C. powder by Reid and Johnson in 1882, and next, that of the J. B. powder by Judson and Borland. The present smokeless powder industry, however, only dates from the manufacture of the poudre B by P. Vielle in 1886, and of ballistite by F. Nobel in 1888. Vielle discovered in the gelatinization of nitrocellulose a method for the satisfactory regulation of its velocity of combustion. The English cordite is a modification of Nobel's ballistite. Vielle's powder is a single base powder of nitrocellulose, while ballistite has the two bases, nitroglycerine and guncotton.

The foregoing notes have served to trace the events in the discovery and development of a smokeless propellant, the advantages of which from a military standpoint are so great that the problem of finding a stable progressive smokeless powder for the use of our navy became urgent, and our Navy Department therefore undertook its solution. Our guncotton factory at the Torpedo Station in Newport had been set in operation in March, 1884. The smokeless powder plant there was really started from saucepans and mortars used in researches in the laboratory of Prof. Charles E. Munroe, who had joined the Torpedo Station in 1886. Actual powder manufacture, the outgrowth of these experiments, seems to have been formally established by B. F. Tracy, Secretary of the Navy, in 1890, when manufacture of indurite was first begun, and the guncotton and powder manufacture were consolidated under one head. At this date we find on duty there the following prominent chemists who are primarily responsible for the successful results obtained in our navy with smokeless powder: Prof. C. E. Munroe, then in charge with G. W. Patterson as his senior assistant; also Mr. Tobin, who later became the head chemist of the

station. When Professor Munroe left the station in 1892 H. F. Brown was appointed as his successor.

The result of Munroe's experiments was the propellant known as indurite manufactured in 1891, which was a single base powder, the first example of such in the art, made from a specially purified high nitration guncotton colloided with mono-nitrobenzene, which substance is known commercially as oil of mirbane. By indurating this plastic mass the colloiding agent was removed. Samples of this indurite made in 1891 are perfectly stable to-day.

A process and the necessary machinery were then developed for producing indurite, which was used experimentally in guns up to and including our 6-inch. This substance was not experimented with after Prof. Munroe's departure from Newport, due to several cases of instability in samples which led his successors into other lines of research. Upon Prof. Munroe's detachment a naval officer was placed in direct charge of the factory.

A single base powder of guncotton, barium and potassium nitrates, and acetone, was next produced, but this was, on account of its brittleness, superseded by a product corresponding to the French powder that was then being manufactured for sale, and is similar to that used in their navy at present, in that it contains two types of nitrocellulose. This contained soluble and insoluble nitrocellulose, barium and potassium nitrates, and was colloided at first with acetone but afterwards with ether alcohol. Patents were taken out on this powder in 1895 by Commander G. A. Converse, U. S. N., and Lieutenant J. B. Bernadou, U. S. N., who were both then on duty at the Torpedo Station, the latter officer being an excellent Russian scholar and the translator of a valuable work by Mendeléef on powder. In the summer of 1895 Lieutenant Bernadou gave to Mr. Patterson a small sample of powder which he had obtained from Russia and which represented the type of powder in use there at that time. The analysis by Patterson showed the powder to be composed solely of a soluble nitrocellulose—quite different, it is to be noted, from the mixture of the two grades of the nitrocellulose then and still used in the French powder—colloided with ether alcohol. Its nitration was found to be about 12.45 per cent. Experiments commenced in November, 1895, resulted in the discovery early in 1896 by Patterson of the mixture of acids necessary to produce the desired result. This year, 1896, then is the date of the adoption of our present powder. The composition of the

powder is based on the results of the work by the Russian chemist, Mendeléef, who deduced a theoretical per cent of nitration for the nitrocellulose required to obtain the greatest gas volume under ballistic conditions, calling it 12.44. The chemical formula given for it is this $(C_{30}H_{38}(NO_2)_{12}O_{25})$ which upon being exploded in a gun breaks down into $(30CO+19H_2O+12N)$.

Practically there have been found the following differences in velocity due to the various percentages of nitration: in a 7"/45 gun it requires 65.8 pounds of powder of 12.29 per cent nitration to give the same velocity as 60 pounds having a nitration of 12.77 per cent; in a 6"/40 gun 25.8 pounds of powder at 12.57 per cent nitration equalled 23.6 pounds at 12.80 per cent; and 343 pounds of nitration of 12.35 per cent in 12"/40 gun give the same velocity as 314 pounds of 12.65 per cent nitration.

At this point it might be well also to answer a question frequently heard in the service as to just what the gases of an explosion contain. A complex series of gases is to be found due to the volatiles and rate of burning in a gun. Quick powders, *i. e.*, those that are entirely consumed before the projectile leaves the gun, give a faint white smoke and high chamber pressures; while slow powders, *i. e.*, those that are not burned by the time the projectile leaves the gun, usually give orange colored smoke, pungent odors and low chamber pressures. The higher the pressure the more nearly the conditions of the theoretical equation of Mendeléef's are reached. At full muzzle velocities we now find carbon dioxide, carbon monoxide, nitrogen, hydrogen, steam, marsh gas, and traces of ammonia and cyanogen compounds.

The maintenance of gas pressure in the bore of guns is shown in the diagram herewith that has been made from actual results obtained in firing black, brown, and smokeless powders, and which gives graphically the reason that we use smokeless powder and are enabled to reach the modern high velocities.

The present form of powder grain was not the first type tried by any means and much experimentation has taken place for years along the line of developing the most suitable granulation for powder. Amongst other forms a grain with 18 perforations was once in use. The present multi-perforated smokeless powder grain, a cylinder with seven longitudinal holes, was designed by Maxim and Schupphaus, and the patent was sold by them to the Du Pont Company, who gave it to the navy.

Pressure Curve of Powders in a Gun
Data Determined at Indian Head in the Fall of 1901
Gun in Use was a 6"/40

Lieutenant Bernadou, with the head chemist at Newport, H. F. Brown, after the proper mixture of acids had been determined in the laboratory by Patterson, developed a method for the manufacture of this powder on a large scale based on the laboratory results, which method showed the practicability of duplicating the Russian type of powder. That is the smokeless powder now in use not only in our navy but also in our army.

In 1895 there were three private explosive plants all operating independently in which the manufacture of such a powder was feasible. These plants were the Laflin & Rand Works at Haskell, New Jersey; the Du Pont Works at Carney's Point, New Jersey; and one concern on the west coast known as the California Powder Works, which manufactured its nitrocellulose at Pinole, and the remaining portion of its powder at Santa Cruz, the nitrocellulose from Pinole being shipped there. These companies differed widely in their machinery and methods but all undertook the contracts for powder, the specifications for which were based on the above-mentioned Newport laboratory work.

The first powder delivered by a private firm was proved in June, 1897, and was made at the Carney's Point plant, the powder being designated as S. P. 3. The California Powder Works in July, 1898, had its first product known as S. P. 7 proven, and similarly the Haskell plant had its first proven in May, 1899, known as S. P. 34.

The Bureau of Ordnance decided in September, 1897, to build a powder plant, and under date of September 28, Lieutenant Commander T. C. McLean, U. S. N., inspector in charge of the Torpedo Station, appointed a board consisting of Lieutenant Kossuth Niles, U. S. N., H. F. Brown, Karl Hedberg, and Frederick Kniffen, to prepare plans and specifications for a factory having a capacity of 1000 pounds per day. These plans were submitted on March 31, 1898, and specifications were given on April 20, 1898. In July, 1898, Congress made available the funds for the erection of a navy factory to be located at Indian Head, Maryland, this point being about 20 miles below Washington on the Potomac River and Mattawoman Creek, it then being the site of our ordnance proving ground.

Shortly thereafter Lieutenant Bernadou was ordered to the Bureau to revise these plans and start the work at Indian Head. Patterson was chosen chief chemist at the Indian Head plant in

July, 1899, by a board consisting of Captain Couden, Lieutenant Bernadou and Brown. In the face of great obstacles Captain A. R. Couden and Mr. G. W. Patterson started the work at Indian Head and evolved the present splendid powder-making plant. The first completed powder grain was run out on June 28, 1900, Lieutenant Joseph Strauss being then in charge of the factory. It was a gnarled and spotted grain, a great contrast to the beautiful clear, translucent grains of the present day, but still it marked the fact that at last we possessed a working powder factory. The first completed index of powder made at Indian Head was known as S. P. 148 and this was proved in February, 1901.

A fourth private plant was built at about this same time (1900) at Parlin, New Jersey, and it was known as the International Smokeless Powder and Chemical Company. This company obtained its supervising force from men at the Torpedo Station, where they had been trained in the investigations, developments and machinery necessary to produce powder. The company obtained contracts from the Navy Department by underbidding the other three private firms by one cent per pound. The first index of powder delivered by them was known as S. P. 199 and was proved in April, 1902. Its success in a great measure was due to the energy and skill of Mr. C. F. Burnside, who is now with the Du Pont Company.

It is thus seen that four firms started in to manufacture cannon powder shortly after the beginning was made by our own government plant at Newport, which plant had delivered the navy's first index of smokeless powder in season to be proved in March, 1896. The Navy Department gradually transferred its powder manufacture to the Indian Head plant and none is now made at Newport.

This powder developed by Patterson from the sample given him by Lieutenant Bernadou, and made commercially practicable by H. F. Brown and the two men just mentioned, was continually improved upon by them and by the personnel of the private plants, which had reached corresponding results and details of manufacture independently after being asked to undertake the work.

The success and cheapening of the manufactured product is traceable in a large degree to a few individuals and the ones most prominent in contributing to the results deserve to be known

in the service. It must be borne in mind that the private firms have contributed in a very large degree to the development of powder in this country and more particularly so after their consolidation under one technical head. H. F. Brown, who had some years before left the Newport plant to develop the Parlin plant, was given this technical direction of the four companies mentioned previously in the year 1904.

The dehydration process by which the water remaining in the nitrocellulose after its washings is displaced by alcohol and the excess alcohol then squeezed out in a hydraulic press—one of the basic operations in manufacture—was brought about by Francis G. Du Pont and applied by him at Carney's Point in 1897. The combination of these two processes into the one receptacle was worked out by W. C. Peyton at the California Powder Works. These two men appear to deserve also equal credit for the solvent recovery process by which during the drying of the finished powder a large proportion of the ether and alcohol used in colloiding it is reclaimed, purified and used again in manufacture, as they really developed the same operation independently of one another though practically at the same time. Francis I. Du Pont, at Carney's Point, produced the Du Pont nitrometer for the nitrogen determinations, which instrument has been a great laboratory help. At the California plant Robert Robertson was the great factor in progressive development and improvement, as was H. C. Aspinwall similarly at the Haskell powder plant.

The Indian Head plant is still under the skilful direction of G. W. Patterson, its first head chemist, who has proven to be not only a chemist but a mechanical engineer of much ability. The design of its dehydration, macaroni and finishing presses can be attributed more to W. C. Peyton than to any other one person. The success of our government plant in great measure is directly traceable also to Rear Admiral Joseph Strauss, who from the start initiated and forced to completion valuable and essential improvements and has always stood as its sponsor in all its progressive development. The present sulphuric acid plant which practically makes the navy independent of privately controlled sources of supply is but one of his achievements there. This sulphuric acid plant succeeded in making acid at about $0.0065 per pound or about 65 per cent of the market price when that plant was built. The mixed acid made costs $0.032 per pound as against $0.035.

The only supplies now purchased by our navy factory are the Tennessee fiber cotton, the sodium nitrate (Na NO 3) from the Atacama and Tarapaca provinces of Chili, where it is found in layers one to five yards deep, the alcohol, and the sulphur. To manufacture a pound of powder now requires approximately .67 pound of cotton, 3.14 pounds of mixed acid, and .75 pound of alcohol. The soda nitrate is used for the manufacture of nitric acid and the sulphur for the sulphuric acid.

Most radical improvements in the various steps required in the manufacture of smokeless powder both as regards the materials and the machinery used are constantly occurring. For the cellulose several materials have been experimented with, these being cotton waste, cotton rags, long and short fiber cottons. The purification and preparation of these various types have been ever to the one end of getting a better product finally. At the present time a specially grown, treated, and purified Tennessee short fiber cotton forms the cellulose. The ether, the alcohol, the soda nitrate, and the acids are the very best that science can produce, as is likewise the water, of which 75 gallons are used for every pound of finished powder.

The Du Pont Company has just invented a new improved method of nitrating cotton and their plants have a capacity of 35,000 pounds per day of nitrocellulose. This process is now to be installed at our Indian Head plant, the plans therefor having been furnished by the Du Ponts.

For many years our powder was an absolutely pure nitrocellulose colloid but the necessity of having the many people under whose care it was placed from time to time familiar with its stability led to an endeavor to put stability indicators into powders. Rosaniline, which colored the powder a brilliant red, was introduced at Indian Head by Patterson in 1902, incorporated in 1907, and was a success there, but was abandoned because the different plants manufacturing powder for the navy did not turn out a product uniform in color, due partly to their water and partly to their storage of the rosaniline in copper instead of galvanized tins. This rosaniline has held up remarkably well in all Indian Head powders and has proved to be just what it was intended to be, a *stability indicator*. The first incipient decomposition fades the color entirely away. No rosaniline powder made at Indian Head has been withdrawn from service.

The early days of nitrocellulose powder were attended with many setbacks, lack of stability[6] oftentimes developing from causes not easy to ascertain. The waste due to this cause led us to make strenuous efforts to utilize the unstable and doubtful powders as well as to determine how to make powder so stable that it would never decompose. A method of reworking powder was discovered in 1905 by the Du Pont Company at Carney's Point and after a successful demonstration the process was given to the navy. The navy contributed essentially to the discovery of this reworking process as Patterson successfully applied the dehydration part at Indian Head although Carney's Point had been unable to do this. S. P. 143, a 3"/50 powder, was the one tried and reworked from March to May, 1906. In this case it was remade into a 7" powder and proved excellent. This reworked product is uniformly opaque instead of being translucent as in the case of the new product.

As showing the need that this process supplied it is well to state that in the year ending July, 1913, there were 965,000 pounds of this reworked powder made. In that same year our factory turned out 1,800,000 pounds of new powder and at present date, January, 1914, is making 11,000 pounds per diem.

Because of the long period consumed in drying the powder, thereby causing a delay in the use of powder until practically four months after its manufacture, much energy has been devoted to shortening this drying process. The time *has* been shortened somewhat but all quick methods of drying have proven unsatisfactory to the Navy Department.

A method of water-drying promised well in 1903 but experience with it showed that the grains were unevenly dried and that the per cent of volatiles could not be predicted with uniformity. Raising the temperature very high for short periods while it hastened the drying had a marked deteriorating effect. The system of moderate temperatures and drying in closed circuit dry houses has proven the best method. At one of the German factories 122° F. is attained gradually in drying but our experience shows this to be a mistake as incipient decomposition is generally started. The Du Ponts having successfully dried several lots of powder at 55° C. still are in favor of increasing the temperature of drying.

[6] See U. S. NAVAL INSTITUTE PROCEEDINGS, Whole No. 136, Vol. 36, No. 4, December, 1910, p. 929, where Commander Strauss discusses the stability question in detail in an article entitled "The Stability of Smokeless Powder."

The uniformity in size, shape, and density of grains continued with great rapidity and these qualities that are so essential to uniform ballistics in the powder have reached a high state of perfection.

In 1909 after much discussion for and against, it was decided to incorporate an organic compound with the powder as a stabilizer. There had been many such used in various countries such as urea, amyl-alcohol, nitro-guanadine, and diphenylamine, but reliable reports as to their actual value could not be obtained. The substance chosen as a result of a European trip made by H. F. Brown in 1898 and sample lots made by the Du Ponts in October was diphenylamine $NH(C_6H_5)_2$, and the first lot of powder with which that was incorporated was turned out in July, 1909, at our factory and shipped to Olongapo, where it could be subjected to the very worst conditions of storage. The private companies have used it since November, 1908, in all the powder made by them for the government. This experiment has proven a success in every way, all indices thus manufactured being as stable now as when first made. This substance is a basic compound and is a pale yellow solid, it is soluble in alcohol, benzene, or ether and is obtained by heating aniline with aniline hydrochloride at from 250° to 260°. This substance absorbs nitrous vapors readily and thus prevents the generation of more. This action should thus make powder indefinitely stable. Indian Head powder with this substance is still bright and clear, although that from the private companies is slightly darker and opaque as a rule. This difference in color seems more due to the water used in manufacture than to any other cause. All diphenylamine powders are yellower, particularly around the edges and perforations, than is powder that does not contain it.

Our Ordnance Bureau in 1908 started a testing station for powders in the Philippines which has resulted in keeping powder there in a very satisfactory state, and also has proven many interesting facts, among them being that moisture and varying temperatures in storage are the worst enemies of powder.

Stabillite was an invention of Hudson-Maxim that was sold to the Du Pont Company and by them communicated to the navy. It is a smokeless powder made with non-volatile solvent and is ready for use immediately after granulation, and as such may have a valuable military use in war.

The English cordite, originally made with 53 per cent nitroglycerine, has now been reduced so as to contain but 23 per cent of nitroglycerine, and there is every reason to believe that this cordite would be abandoned for our nitrocellulose powder if it were not for the fact that its adoption would cause such an enormous change in ordnance material that the resulting expense would be beside the question.

The high explosive industry was started by Herman Sprengel,[1] who observed that every compound capable of internal combustion and every mixture of oxidizing and combustible components can, under the influence of a detonator, be brought to decompose. He started his experiments in 1873 by directing the attention of the explosive industries to picric acid. This had been used only as a dye, but now, so great has become the need for it, its manufacture is in the hundreds of thousands of pounds per year. It is manufactured by the nitration of carbolic acid. The various safety explosives for mines have been on the market since 1886 and Sprengel was the most prominent person in their development. That mining with the safety explosives has become comparatively safe is shown by the fact that in Prussia one death is now caused by the use of each 11,000,000 tons of explosive, whereas in 1895 it was one to every 539,000 tons used.

All navies have experimented with shell fillers, torpedo and mine charges of high explosives. Our service uses Explosive D for shell-burster charges, and this explosive, which was developed by Major B. W. Dunn, U. S. A., has given better results than any of the very numerous shell fillers experimented with up to date. This explosive is perfectly safe to handle, keeping it away from lead salts only, is unaffected by a temperature of as high as 190° continued for a period of 120 days. It is manufactured for both services by the Semet Solvay Company of Syracuse, New York.

For mine and torpedo charges TNT, exhaustively treated of in the PROCEEDINGS for June, 1913, page 721, is forging to the fore and bids fair to be soon substituted for our wet and dry guncotton therein. We have been fortunate of late in having a really successful detonating fuse developed that is perfectly safe under all conditions of handling and stowage. Details regarding this and Explosive D are of course held as confidential, though each officer who desires to learn more of them than it is proper to give here may do so through our Bureau of Ordnance.

[1] Explosives, Brunswig: Trans. by Munroe and Kibler.

The foregoing pages have briefly brought out the persons and the events connected the most intimately with the production of our modern navy explosives, and I trust that the main credit has been properly placed. Our service must also bear in mind that each successive inspector of ordnance in charge at Indian Head in conjunction with the powder expert, G. W. Patterson, is primarily responsible for the superb quality of our powder to-day. The quality of the product of our factory is now at least equal to any powder manufactured anywhere. We must accord great credit also to the co-operation of the chemists and the superintendents of the Du Pont Company, several of whom as noted, were trained in the powder business in the early days at Newport, as well as to the naval inspectors of powder who by study and observation have materially assisted in the continual improvement in the processes of the manufacture and the quality of the finished powder.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A HALF CENTURY OF NAVAL ADMINISTRATION IN AMERICA, 1861-1911

By CHARLES OSCAR PAULLIN

XII

THE NAVY, 1897-1911

SECTION 2. MATÉRIEL

The building of ships has been greatly accelerated since 1897. The rate at which keels were laid down before that date now seems exceedingly slow. With the exception of Great Britain, the United States has in recent years increased her fleet faster than any other naval power. When the ships that have been authorized are completed, the American navy, in efficiency, will be exceeded only by that of Great Britain; and in number of ships and tonnage, only by the navies of Great Britain and France. New vessels have been authorized each year since the Spanish-American War, with the exception of 1901. Counting ships built, building and authorized, the navy in 1897 consisted of 141 vessels; and in 1910, of 371 vessels. Of the latter, there were fit for service 308 vessels; under construction, 31; authorized, but their construction not yet commenced, 20; and unfit for sea service, 12. The armored fleet of the navy, its real dependence in time of war, has been remarkably strengthened. In 1897 it consisted of 20 vessels: 9 first-class battleships, 2 second-class battleships, 2 armored cruisers, 1 armored ram and 6 harbor-defence monitors. In 1910 it consisted of 58 vessels: 35 first-class battleships, 1 second-class battleship, 12 armored cruisers and 10 harbor-defence monitors. To the unarmored fleet there have been added since 1897, nine protected cruisers, and a large number of torpedo-boats, torpedo-boat destroyers, submarine torpedo-boats and subsidiary vessels. The later armored ships are much larger than the earlier ones. The dis-

placement of the first-class battleship *Indiana*, authorized in 1890, was 10,225 tons; that of the *Minnesota*, authorized in 1903, 16,000 tons; and that of the *Nevada*, authorized in 1911, 27,000 tons. The displacement of the *Brooklyn*, one of the first armored cruisers, is 8150 tons; while that of the *Tennessee* is 14,500 tons. The cost of a battleship, including her armament, of the date 1904 was about $8,000,000 and of 1911 somewhat more.

The speed of the more recent ships is greater than that of the first vessels of the New Navy. A notion of the size, strength and armament of the later battleships of the navy may be obtained from some figures respecting the *Nebraska*, a 15,000-ton ship commissioned in 1907. This ship has a water-line length of 435 feet; her beam is 76 feet 2½ inches, and her maximum draft 26 feet. Her complement consists of 41 officers, 675 enlisted men and 60 marines. Her twin reciprocating engines are designed to generate 19,000 horse-power and to give a speed of 19 knots. Her main battery consists of 12-inch and 8-inch guns, and her secondary battery of 6-inch, 3-inch, 3-pounders and 1-pounders. Her torpedo armament is exceedingly powerful, consisting of four 21-inch torpedoes driven by turbine engines. The total weight of her armor is 3690 tons. Two of the new 27,000-ton battleships are to be 565 feet long and 95 feet beam, and each of them is to carry ten 14-inch guns.[271]

The Navy Department has continued to follow the policy of building its ships under contract with private shipbuilders, although considerable opinion favorable to constructing vessels in the government yards exists. Now and then ships are built in the yards, but their cost always exceeds that of sister-ships constructed by private builders. In 1905 31 vessels were being constructed by 12 shipbuilding companies. Six different companies were constructing battleships. Cramp and Sons, of Philadelphia, and the Union Iron Works, of San Francisco, have had the largest part in building the new fleet. In 1903 it was said that one-half the larger ships of the navy had been constructed by the Cramps. Other leading shipbuilding firms are situated at Bath, Maine; Quincy, Massachusetts; Camden, New Jersey; Newport News, Virginia; and Seattle, Washington. During the fiscal year 1905 the Bureau of Construction and

[271] Scientific American, Aug. 4, 1906, p. 82; Dec. 22, 1907, p. 462; July 13, 1907, p. 22.

Repair inspected 154,000,000 pounds of steel; and the Bureau of Steam Engineering, 50,000,000 pounds of engineering materials. The steel was furnished by 65, and the engineering materials by 318 companies. At the same time other private establishments were manufacturing large quantities of materials for the Bureaus of Ordnance and Equipment. Each bureau inspects its own materials.[372]

To meet the navy's increasing demand for armor, the Bethlehem and Carnegie companies greatly enlarged their plants. In 1903 the Navy Department obtained a third source of supply in the Midvale Steel Company, of Philadelphia. The prices paid for armor in 1903 and 1904 ranged from $400 to $420 a ton, exclusive of royalties. The first armor of the New Navy was contracted for at the rates of $574 and $605 a ton. In 1893 it was costing $646 and $671 a ton. In 1897 Congress came to the conclusion that the Bethlehem and Carnegie companies were not competing with each other, and were forcing up prices. On March 3, 1897, a law was passed limiting the average price to be paid by the department for armor at $300 a ton; and on July 19 another law was enacted authorizing the Secretary of the Navy, in case he could not obtain armor at that price, to begin the establishment of a public armor factory, and to appoint a naval board to advise him on the subject. The Carnegie and Bethlehem companies declined to submit bids on the ground that armor could not be made at the price established by Congress. On August 5, 1897, Secretary Long appointed the Armor Factory Board, of which Commodore J. A. Howell was president. This board held sessions from August to December, 1897, and made a report in which it estimated the cost of establishing a factory at $3,748,000. Secretary Long was not favorable to the proposed enterprise, and the war with Spain caused the government to come to terms with the armor makers. In May, 1898, Congress raised the maximum price to $400 a ton, and contracts were let to the Carnegie and Bethlehem companies to furnish all the armor that was then needed.

In 1899 Congress again reduced the price of armor to $300 a ton, and the Navy Department again failed to find bidders. In 1900 Congress, displaying much confidence in the Secretary

[372] Ann. Rept. of Chief of Bureau of Construction and Repair, 1905, pp. 13-16; Ann. Rept. of Chief of Bureau of Steam Engineering, 1905, p. 28.

of the Navy, authorized him to contract for armor at any price which in his judgment was reasonable and equitable, and in case of failure to purchase, to begin the construction of an armor factory, for which purpose $4,000,000 was appropriated. Secretary Long did not find it necessary to avail himself of the latter alternative, for he succeeded in making contracts on reasonable and equitable terms, agreeing to pay for Harveyized armor $411.20 a ton, and for Krupp armor $456 a ton. The long series of difficulties of the department over the purchase of armor now came to an end.[273]

Since 1897 many important and permanent improvements have been made in the establishments under the Bureau of Ordnance. From 1897 to 1902 the volume of the work at the Naval Gun Factory increased almost threefold, and since 1902 it has been further augmented. In 1905 this factory employed 3929 workers of all sorts, including officers, clerks, mechanics and laborers. Even by running continuously, day and night, it has been unable to manufacture all of the large guns required by the navy. Contracts have been let to the Bethlehem and Midvale companies for the completed guns and gun-mounts for some of the new ships. The Army Gun Factory at Watervliet, New York, also furnishes guns for the navy.

The largest gun ever built at the Naval Gun Factory was a 14-inch breech-loading, rifled cannon. The standard gun, which is made of nickel steel, is the 12-inch cannon, and is 46.1 feet in length and weighs 62.5 tons. When mounted its total weight is 108 tons. Its projectile weighs 870 pounds, and its maximum charge of smokeless gunpowder 400 pounds. The muzzle velocity of its projectile is 2800 feet a second, and its maximum range is about 12 miles. Its fighting range is from 5000 to 6000 yards, at which distance its projectile will penetrate about 14 inches of steel. It is a built-up gun, as are all the guns of the navy, being composed of nine sections, exclusive of its breech mechanism.[274]

The war of 1898 revealed the defects and needs of the naval magazines, and since its close the facilities for the storage and

[273] House Doc., 55C. 2S., No. 95; Congressional Record, XXXI, 934; XXXII, 2190-2191; Long, New American Navy, I, 49-52; Ann. Rept. of Chief of Bureau of Ordnance, 1905, pp. 45-47.

[274] Vandegrift and Bassett, Washington Navy Yard, 22.

manufacture of ammunition and explosives have been much extended and improved. Many new buildings have been erected, and the sites of the magazines have been enlarged by the purchase of additional grounds. About 1898 11 acres were added to the site of the naval magazine at Fort Mifflin, Pennsylvania. In 1900 the grounds of the St. Juliens Creek naval magazine, near Norfolk, were increased by the addition of 25 acres. In 1900 Iona Island, situated seven miles below West Point, New York, was acquired for a naval magazine convenient to the New York navy yard. It contains 116 acres of land, and cost $160,000. In 1902 79 acres adjoining the gunpowder depot at Lake Denmark, New Jersey, were obtained. Sites for magazines have been acquired at Hingham, Massachusetts, and Ostrich Bay, Washington. The magazine at Hingham is to supersede that at Chelsea, and is to serve the Portsmouth and Boston yards. The magazine at Ostrich Bay will furnish ammunition to the vessels that frequent Puget Sound. A naval magazine for the Philippine Islands has been constructed. In 1899 "Cedar Grove," near Norfolk, was purchased as a rendezvous for torpedo-boats. In 1901 1200 acres were added to the Naval Proving Grounds at Indianhead, Maryland. A smokeless powder factory has been erected there, and in other ways the establishment at this place has been developed. The Naval Torpedo Station and the Rose Island magazine near Newport have been much improved.[273]

Soon after wireless telegraphy was invented, the Bureau of Equipment made a study of it with a view to introducing it into the navy, and in 1901 Commander F. M. Barber (retired), residing in Paris, was ordered to report upon foreign wireless appliances. In 1903 the establishment of shore stations and the installation of wireless apparatus on shipboard was begun, and by 1905 48 vessels and 36 shore stations were either equipped or were being equipped. The shore stations were situated on the Atlantic, Gulf and Pacific coasts, at San Juan, Guantanamo, and Colon, and in the Philippines. Since 1905 many improvements in the equipment and installation of wireless apparatus have been made.

The beginning of aviation in the navy may be dated with a successful flight made in a Curtiss biplane in November, 1910,

[273] Miscl. Data, Bureau of Yards and Docks, 35, 46, 50, 52, 81, 83.

from the deck of the U. S. S. *Birmingham* at Hampton Roads. In December the Secretary of the Navy recommended the appropriation of $25,000 to carry on experiments in the development of aviation for naval purposes, and Congress in March of the following year made the appropriation. With the money thus supplied three flying machines were purchased and an aerodrome established at Annapolis. Some initial flights over Chesapeake Bay and the neighboring country have been made by Lieutenant John Rodgers, U. S. N.[276]

During the '80's and early '90's the improvement of the navy yards, docks and naval stations did not keep pace with the reconstruction of the fleet. In his first annual report Secretary Long devoted much space to setting forth the urgent need of the navy for adequate docking facilities and for the establishment at the principal navy yards of well-equipped repair shops, and referred to the desirability of concentrating the power stations of each yard. In the summer of 1897 he appointed a board to consider the construction of new docks. The estimates for the improvement of the several navy yards submitted by their commandants in 1897 called for the expenditure of more than $8,000,000.[277] The deficiencies of the navy yards were especially felt during the war with Spain, and Congress was moved to take some initial steps toward improving their facilities for the docking and repairing of ships.

By 1899 the improvement of the yards and docks began to be vigorously prosecuted. The establishments at Portsmouth, Boston, League Island and Pensacola, which had been for the most part closed since 1883, were reopened, and the expenditures at these yards were greatly increased. The development of the League Island yard was for the first time begun in earnest, and in 1901 the appropriation for its improvement amounted to almost a million dollars. The grounds of the Washington and the Norfolk yards were enlarged. Two new navy yards were established, one at Charleston, South Carolina, and the other at the naval station on Puget Sound, thus increasing the number of navy yards in the United States to ten.

The improvements recently made at these ten establishments have been numerous and important. Various shops and build-

[276] Ann. Rept. of Sec. of N., 1910, p. 23; 1911, p. 58.
[277] Ann. Rept. of Sec. of N., 1897, pp. 12-18.

ings have been erected, and much machinery has been installed for the repair of hulls and engines. Among the improvements are new water and drainage systems, paved streets, new wharves and quay walls, electric lighting of buildings and streets, and the installation of telephones and railway connections. In 1905 the consolidation of the power stations at the several yards was begun. The New York yard has been fitted out for the construction of battleships; and with little additional expense the Portsmouth, Boston, Norfolk and Mare Island yards might be similarly equipped. At these five establishments are located the principal repair shops of the navy. In 1902 the Bureau of Construction and Repair employed more than 5000 workmen and expended about $16,000,000 at the principal navy yards in the United States. From 1897 to 1905 the number of employees of the navy yards and naval stations, including officers, seamen, clerks, mechanics and laborers, at home and in our colonial possessions, increased from less than 7000 to more than 24,000.[278]

The organization and economy of the navy yards have continued to elicit differences of opinion both in and out of the navy. Various boards have from time to time given advice, and more than one Secretary of the Navy has attempted reforms. Early in 1909, after a board, of which Rear Admiral C. F. Goodrich was president, had considered the subject and made recommendations, Secretary Newberry put into operation a plan for reorganizing the yards. All the mechanical departments, all the laborers of the yard, the care of buildings and grounds, and all civil engineering work were placed under the direction of a manager, and a single pay-roll for the manufacturing department was created. Under the new plan the manager was able to reorganize the manufacturing and repair work, to consolidate the power plants, to reduce the number of ships, and to distribute more economically the machinery and tools. The commandant was left nominally in control, but with little real supervision over the manager. Secretary Meyer did not wholly approve of Newberry's reforms, taking the view that they deprived line officers of an opportunity to obtain experience in shop and navy yard work, and on July 1, 1909, he placed the work of repairing the machinery of ships under the direction of line officers.[279]

[278] Sen. Doc., 57C. 2S., No. 110, Official Register of U. S., 1897, 1905.

[279] Army and Navy Journal, XLVI, p. 580; Ann. Rept. of Sec. of N., p. 12.

Another reform recently attempted is the reduction of the number of navy yards and naval stations. Shortly before Secretary Newberry went out of office he issued an order closing certain southern yards, but this was suspended by his successor on the ground that it was illegal and unwise. Later however Secretary Meyer recommended that the navy yards at New Orleans and Pensacola and the naval stations at San Juan, Port Royal, New London and Sacketts Harbor be abandoned. In 1911 the subject of navy yards and naval stations was considered by a joint army and navy board, which reported in favor of a considerable reduction in their number. Owing to the interests of politicians and their constituents in the maintenance of naval establishments, it has so far been impossible to settle this question by an appeal to military needs and principles.[280]

The improvement of the docking facilities of the navy began with the appointment by Secretary Long on August 7, 1897, of a navy board, with Commodore F. M. Bunce as senior officer, to consider the subject. One of its members visited the dockyards of the European navies, and made a report on them. The board recommended the construction of six large graving, and three steel floating dry docks, and reported that docks were urgently needed at Boston, New York, Norfolk, Port Royal, New Orleans and Mare Island.[281] Admonished by the war with Spain, Congress made its first authorizations on May 4, 1898, when it provided for the construction of four graving-docks of timber, one each for the Portsmouth, Boston, League Island and Mare Island yards; and of a floating steel dock for the New Orleans naval station. Later, Congress decided to build the graving-docks of granite and concrete, since docks built of masonry last longer, need fewer repairs and are more serviceable than those constructed of timber. These four docks are larger than any previously constructed in the United States. They vary little in size, the one at League Island being 753 feet long, 140 feet wide, and 31 feet deep.

Soon after the close of the Spanish-American War, Congress authorized the construction of three additional graving-docks, of granite and concrete, to be built one each at the Charleston, Norfolk and New York navy yards. In 1901 a steel floating

[280] Ann. Rept. of Sec. of N., 1909, p. 16; 1910, pp. 32, 35; 1911, p. 22.
[281] Ann. Rept of Sec. of N., 1897, p. 13; Sen. Doc., 55C. 2S., No. 107

dock was purchased from the Spanish government for $195,000, and was removed from Havana to the Pensacola navy yard. A floating steel dock for the New Orleans station was built by the Maryland Steel Company, at Sparrows Point, near Baltimore. In 1905 the same company, at a cost of $1,125,000, completed the steel floating dock Dewey, intended for the naval station at Cavite, Philippine Islands. Under the command of Commander H. H. Hosley it was successfully towed from its place of construction to the Philippines by way of the Mediterranean Sea, a distance of 13,000 miles. In 1907 the construction of a dry dock at Puget Sound, and in 1908 one at Pearl Harbor, Hawaii, were authorized. The docking facilities of the navy are now vastly improved over those of 1897, when there were only three docks capable of receiving battleships, and one of these, the Port Royal dock, was too small to permit the entrance of a battleship fitted with bilge keels. In that year, when the large dock at New York was out of repair, the Navy Department found it necessary to send the *Indiana* to Halifax, Nova Scotia, to have her bottom scraped and cleaned. At the present time such a mortifying necessity could scarcely arise.[282]

During the decade 1897-1907 considerable improvements were made at the various naval stations in the United States. The Navy Department increased its holdings of land at Newport, Annapolis, Port Royal, the Dry Tortugas, Key West and New Orleans. In 1898 and 1899 41 additional acres of land were acquired at Port Royal, and in 1901 the department decided that that place, owing to its inconvenient location and its shallow harbor, was not fitted for a naval station, and that a better site could be found near Charleston. A naval board which considered the subject recommended a location six miles above Charleston on the west bank of the Cooper River, and later more than a thousand acres were purchased there, extensive improvements made, and a large granite graving-dock constructed. Port Royal is now but little more than a coaling station.[283]

The need of greater and better coaling facilities became urgent during the war of 1898. In June of that year Secretary Long appointed a board, of which Rear Admiral George E. Belknap

[282] Long, New American Navy, I, 113.
[283] Ann. Rept. of Sec. of N., 1901, p. 144.

(retired) was president, to report on the location of coaling depots at the navy yards and naval stations in the United States. After visiting various sites, this board made a lengthy report, in which it recommended the establishment of coaling pockets and modern coaling facilities at nine ports on the Atlantic seaboard. During the war steps were taken for the installation of modern coaling plants at Key West and the Dry Tortugas. On May 4, 1898, Congress appropriated $250,000 for the establishment of suitable coaling depots, and at its next session it gave $400,000 more for the same purpose. Improved facilities for coaling are now provided at the principal yards and stations in the United States and several depots for coal have been established at other points on the coast. At Frenchmans Bay, Maine, there is a 10,000-ton coaling depot, and a stand-pipe which will hold 250,000 gallons of fresh water. A new coaling plant on Narragansett Bay has a capacity of 40,000 tons, and one at New London of 10,000 tons. The facilities for coaling have been greatly increased at the Dry Tortugas and Key West, and a new coaling plant has been installed at New Orleans. On the Pacific coast, in addition to the coaling depots at the Mare Island and Puget Sound navy yards, there are coaling facilities at San Diego, California City Point, and Pichilinque Bay in Mexico. There is a coaling station at Sitka, Alaska. The establishment of a small station at Dutch Harbor, Alaska, and a large one at Kiska Bay, Aleutian Islands, has been considered by the department.[284]

Several important naval stations and coaling depots have been established in our island possessions, and the location of others is contemplated. After the war with Spain a naval station was maintained at Havana until it was abandoned in 1903. According to the terms of the Platt Amendment and of the Cuban Constitution of 1902, Cuba agreed to lease lands to the United States for coaling or naval stations. In 1903 she carried out this agreement by granting to the United States, for a yearly rental of $2000, complete jurisdiction and control over certain lands at Guantanamo on the eastern part of the southern coast of the island and containing 18,530 acres and a smaller tract at Bahia Honda on the western part of the northern coast.[285]

[284] Ann. Rept. of Sec. of N., 1898, pp. 177-191; 1899, pp. 25-26; Proc. of U. S. Naval Inst., XXX, 568-570.

[285] Ann. Rept. of Sec. of N., 1903, pp. 14-15.

Surveys of the Guantanamo reservation and some initial improvements upon it have been recently made, including the construction of a dry dock at a cost of $1,400,000. Plans for a coaling station at Bahia Honda have been prepared.

The principal naval station in the Philippine Islands is located at Olongapo, Luzon, on Subig Bay, whose mouth is 30 miles north of Manila Bay. The naval base of the Spanish was at Cavite on Manila Bay, but they had recognized the superior advantages of Subig Bay, and had commenced there the construction of a naval station. Two naval boards, together with Admiral Dewey, reported in favor of establishing a naval base at Olongapo, and in 1905 Congress appropriated $862,000 for the improvement of the site there, which contains about 30,000 acres. In 1909 a joint army and navy board, instructed by the events of the Russian-Japanese War, reported against the establishment of an extensive station at Olongapo, and in favor of the selection of Pearl Harbor, Hawaii, as the American naval base in the Pacific. The building up of a station at the latter place is now under way. Among other improvements a dry dock to cost $2,000,000 has been authorized. After the war with Spain, the Cavite station served as a base for the naval vessels in the Philippines, although it was deficient in many particulars. Here were located repair shops, storehouses, officers' quarters, barracks, coaling depot, and until recently a naval hospital. In 1905 more than 3000 employees, including officers, clerks, mechanics and laborers, were employed at Cavite.[290] Depots for coal and supplies were established at Isabela de Basilan, Cebu and Polloc.

The United States has a naval and coaling station at Yokohama, Japan. The Hawaiian naval station situated near Honolulu comprises some 700 or 800 acres of land, and has a coaling plant with a capacity for 30,000 tons. This will be superseded by the Pearl Harbor station. United States naval stations are located at the islands of Tutuila and Guam, where facilities have been provided and other improvements made. The senior naval officers at these islands not only act as the commandants of their stations, but they are also charged with the duties and responsibilities of military governors, in which capacity they exercise plenary powers. Their reports deal with the health, schools,

[290] Official Register of U. S., 1905.

roads, occupations and government of their respective islands. Two small naval stations are maintained in Porto Rico, one at San Juan, and the other at Culebra to the eastward of the main island.

The acquisition of tropical territories and the recent increase in the number of officers and enlisted men of the navy has greatly added to the work of the medical corps, which is now called upon to treat various tropical diseases abounding in our island possessions. In 1899 a temporary naval hospital was established at Cavite. In 1905 a permanent naval hospital for the Philippines was completed at Canacao, where the Spanish had begun the erection of a hospital. It is about a mile from Cavite, situated on a narrow sandy peninsula, and is freely swept by refreshing breezes from Manila Bay. Other naval hospitals in the Pacific are maintained at Yokohama, Sitka, Honlulu, Guam and Tutuila. At the two latter islands the care of sick natives falls in large part upon the naval surgeons. At Guam the patients, whether natives or sailormen, are treated at the Maria Scroeder Hospital, established by our government. The naval hospital at Tutuila, we are told, was a few years ago "far from what it should be. It was a trader's store, over 30 years old, rotten in every part, leaking, and infested with vermin." The hospital for the natives was in a separate building. "It is a thatched-roofed native hut, and answers its purpose well."[287] In January, 1904, a hospital for the San Juan naval station was established at Puerta de Fiera.

In the United States new naval hospitals have been constructed at Washington and Annapolis. With the exception of these two and those at New York, Mare Island and Canacao, the hospitals of the navy are said to be "ill arranged for administration, as well as for the care and treatment of the sick, are defective in design, lacking in many essentials of proper construction, obsolete in type, inadequate in capacity, and require remodeling to adapt them to the demands of modern medical and surgical practice."[288] These old buildings are much inferior to the better class of civilian establishments. In 1905 a new naval supply depot was being erected at New York. Medical depots are also maintained at Mare Island and Cavite. In 1902 the school for

[287] Ann. Rept. of Surgeon General of U. S. Navy, 1905, p. 101.
[288] Ann. Rept. of Surgeon General of U. S. Navy, 1905, p. 15.

naval surgeons at the old depot or "naval laboratory" at New York was moved to Washington, and combined with the Naval Museum of Hygiene. At first the new establishment was known as the "Naval Museum of Hygiene and Medical School," but later its name was changed to the "Naval Medical School." The course of instruction at the school was enlarged and improved, and adapted not only to the needs of the recruits to the surgical corps, but to the older surgeons as well. In 1902 a training school for the members of the naval hospital corps was established at the Norfolk naval hospital.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE PARAMOUNT DUTY OF THE ARMY AND NAVY

By REAR ADMIRAL BRADLEY A. FISKE, U. S. Navy

The people of the United States are developing an anti-military spirit. Things military are struggling for existence. The principle that the military should be subordinate to the civil authority is being interpreted in a spirit more adverse to the military than in any other powerful country. The proper balance between the civil and the military is being lost. Military necessities are pushed too far into the background of the national thought and conscience.

On the army and navy devolves the task of keeping them in the foreground. If this be not done, the insistent requirements of business, society, and pleasure will monopolize the attention of the nation, military character will deteriorate, the martial spirit will be smothered, and this rich but unwieldly nation will meet disaster, through lack of martial power.

We must insist that adequate martial power shall be supplied. To supply adequate martial power in any nation requires self sacrifice and labor, but the effort develops character and health. It creates the ideal state for both the individual and the nation. When that state has been attained, when the martial power of a country is just enough to impart stability to the government and sturdiness to the people, national character and national happiness reach their highest plane. In that serene and sane condition confidence pervades the air, wisdom and strength guide the counsels of the nation, peace rests secure, honor is the watchword, law and order reign.

The conservative influence of a highly trained army and navy gives a country a stability that no other means can give. Political parties come and go; theories of government have their ephemeral vogue; standards of conduct change; great families rise and wane; wealth accumulates and dissipates; individuals strut their brief hours of triumph on the stage. But the army and navy go on,

essentially unchanged, from generation to generation, the only life-long representatives of the country as a whole; the actual force that held—and still holds—the separate states together; the enduring tie that unites them as a nation; the trustees of the military spirit of our fathers, that made the nation strong.

To keep alive the spirit of our fathers amid the harsh realities of war and the soft forgetfulness of peace, is the paramount duty laid upon us. To do this duty well must be our ceaseless and supreme endeavor: to the end that we may pass along the sacred fire, received from Washington and Grant and Sherman and Jones and Farragut and Barry; to the end that the honor of the country shall not perish in our keeping; to the end that we may be a safeguard to the United States of America, a security to every ship with friendly mission that shall sail upon the sea.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

METALLOGRAPHY: THE LATEST AID IN INSPECTING METALS

By Lieutenant J. F. Daniels, U. S. Navy

Metallography.—This science has to do with the art of metals and metal-working. By means of it the structure (anatomy) of metals is bared to the microscopist, and the information thus obtained is to a large extent the responsible factor in the rapid strides which are being made in the manufacture of materials of construction.

Photomicrography.—This is the essential means whereby a photographic-microscopic record is made of the structure of metals under inspection or investigation; a number of photomicrographs accompany this paper.

Testing Metals.—For many years the quality of metals was largely determined by physical testing and chemical analysis. Standards of tensile strength, elastic limit, reduction of area, etc., were created; and, limiting amounts of phosphorus, sulphur, and so on, specified. These tests, by themselves, were not sufficient to gage the actual quality of the material for it frequently happened that important structural members, pronounced satisfactory after testing, were found to fail in service. It was here that metallography stepped in as an aid to the inspection and testing of metals. The ideal structure of a metal, as shown by the microscope, is fine-grained and homogeneous. (See Fig. 4.)

How it is Used.—Until very recently, the microscopic investigation of steel was made on small pieces taken from various parts of the member. These were carefully polished, using a grinder or file to prepare the surface, which was afterwards rubbed down with emery of increasing fineness and finally polished with tripoli powder and jewelers' rouge. The piece was then etched in a 5 or

10 per cent solution of nitric or picric acid in alcohol. When such a piece is placed under the microscope the polygonal net work shown on Fig. 1 is revealed.

It does not always happen that small pieces may be taken for examination, and the latest practice in such cases is to prepare a number of places on the member being inspected and to mount the microscope over these areas. As a rule, however, the pieces cut for physical testing will furnish ample material for microscopic work. This does not mean that the finished product should be neglected

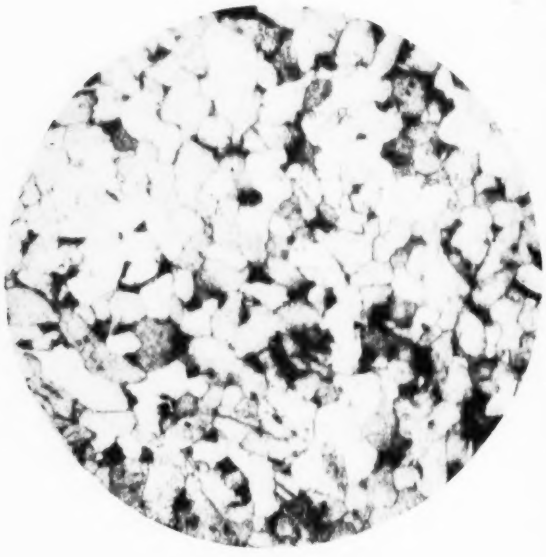


FIG. 1.—BOILER PLATE

even if samples taken therefrom should indicate a satisfactory condition. All important metal members such as crank-shafts and the like should be examined critically before acceptance.

The structure of steel will be different depending on the carbon content, heat treatment, and content of special alloys. As an example of the first, Fig. 1, containing about 0.30 per cent of carbon may be compared with Fig. 2, containing about 0.35 per cent.

In the revealed structure, or anatomy, of a metal, Fig. 2 is an example of the value of metallography in that a decidedly faulty structure is shown to exist. A great streak, or ghost. passes

through the center of the mass. This weakens the material considerably as will be understood when it is known that the tensile strength of the constituent forming the white streak is probably not more than 45,000 pounds as compared with 65,000 or 70,000 pounds for the outlying regions. A chemical analysis of this material would probably show a normal condition. If the piece were to be tested for tensile strength and the pull be in the direction of the streak, it is quite likely that no appreciable difference would result because of its presence. Were the test specimen to be

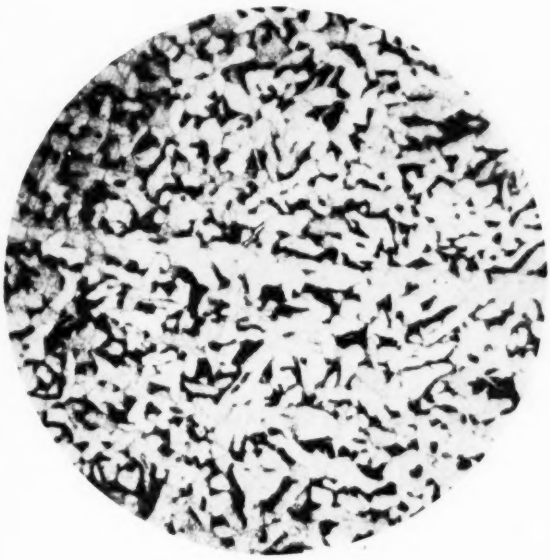


FIG. 2.—BOILER FURNACE

cut so that the pull would come in the contrary direction, the piece would fail.

Steel if improperly heat-treated will be injured and rendered unfit for the use intended. For this reason every inspector of steel for the navy should carefully study the effect of heat treatment in order that he may be qualified to determine proper methods as compared with improper ones. Once a question of experience and shop practice, heat treatment has now become a more exact science. The period of guesswork, or glance of eye, is past, and precision heat-measuring instruments used instead.

An example of improper heat treatment is shown in Fig. 3. In the figure continuous streaks are shown.

In Fig. 3 it is seen that certain zones are rich in iron (ferrite), and impoverished in carbon, while other zones are rich in carbon and impoverished in iron. A simultaneous outflow of the richer constituent to the impoverished one would create a better balance, remove the weaknesses indicated by the segregated ferrite, and produce strong and durable metal. It does not follow that this metal is injured beyond repair, for by following precision methods

FIG. 3.—NICKEL STEEL CRANK-SHAFT

a further and correct heat treatment may be given to restore the quality of the structure.

Such a restoration is shown in Fig. 4. Here the metal has been retreated, and a better balance effected. The objectionable streaks have been eliminated and the whole field presents a finely developed structure indicative of durable and satisfactory metal.

In addition to showing the effect of improper heat treatment, and of the proper effect when the steel has been rightly handled, the microscope in the hands of the metallographist will reveal in-

clusions of slag, manganese and iron sulphides, or other impurities. These inclusions are shown in Figs. 5 and 6.

The first shows a low carbon steel, such as would be used for boiler drums, etc., and the second a nickel steel forging such as is used for crank-shafts. These figures emphasize the importance of the microscope for it is quite likely that the test specimens from which they were taken cut from certain steel members, during manufacture, may have been free from these impurities.

It may show why supposedly sound forging of engine crank-

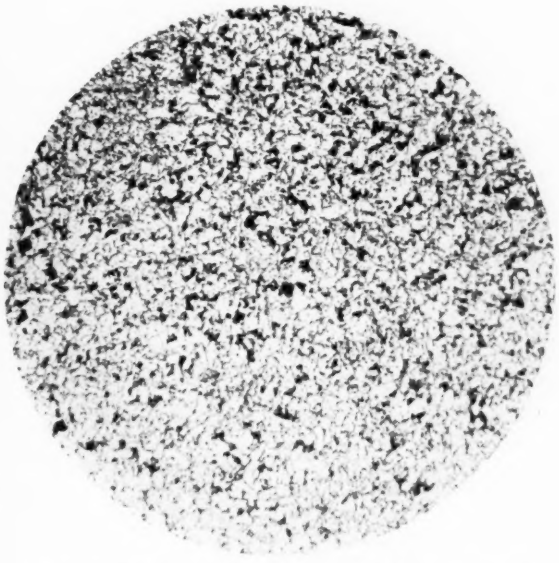


FIG. 4.—SAME AS IN FIG. 3, BUT HEAT-TREATED

shafts fail in service even though these shafts were carefully inspected; and may be of the utmost value in determining the rejection of such material when submitted for acceptance.

A further instance of the value of the microscope is shown in Fig. 7. The photomicrograph was taken from a section of boiler tube. Every engineer has to expand a boiler tube now and then and the purpose of introducing this figure is to show what takes place during the cold working (expanding) of the tube. The part next the expanding tool is crushed back, distorting the crystal forma-

tion until the normal condition of the metal is impaired. This crushing back of the crystals cannot be avoided, and no harm is done so long as the outer boundary is not injured. If the tube be rolled until the whole thickness of metal is injured, it is quite likely that the tube end will eventually split or at least reach that point where further expanding will not avail to prevent a leaky joint.

Heat Treatment.—It is not intended to take up the question of heat treatment at length in this paper, but merely to give a short

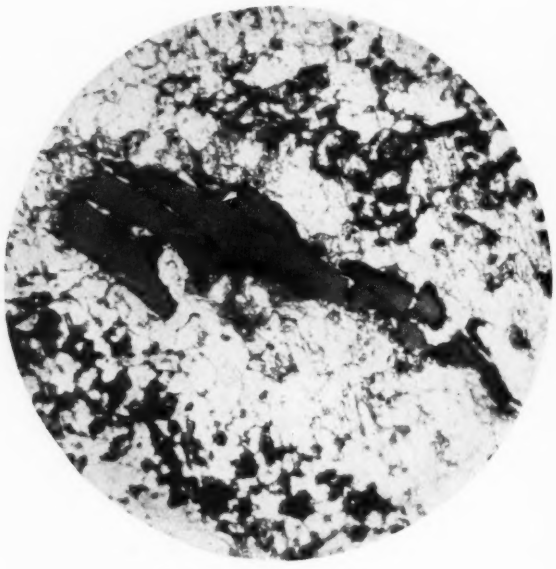


FIG. 5.—BOILER DRUM

introduction to a very important subject. With modern appliances such as may be obtained at this time, the practice of putting a tool in the fire, pulling it out and squinting at it until the right temper color has been obtained, then plunging it into water, or oil, may answer very well for a few cold chisels or the like, but not for high-speed cutting tools. Nor can the " expert " handle tempering or annealing by eye any longer.

Handy and properly made furnaces with recording pyrometers; absolute knowledge of the proper temperatures to use; cooling

periods to produce the result desired; are at this time the implements that have driven the "expert" out of business.

A simple diagram will serve to show that for the heat treatment of steel, a temperature absolutely suited to one grade of metal is entirely unsuited to another grade. This can be seen in the following diagram (Fig. 8), where ordinates are temperatures in degrees centigrade and abscissæ are varying carbon contents. The lines within the axes indicate co-ordinate temperatures and carbon con-

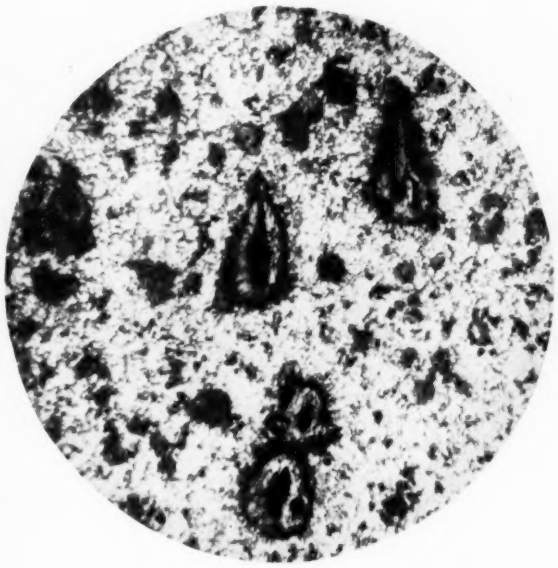


FIG. 6.—NICKEL STEEL CRANK-SHAFT

tents at which a marked change takes place in the structure of the metal, as well in a descending temperature as in a rising temperature.

If it be shown that a steel of 0.50 carbon when heated up to 750° C. has resolved into a solid solution of Austenite, heating a steel having 0.30 carbon to the same temperature will, according to the same diagram, have just entered the Beta zone and will not wholly resolve into Austenite until a temperature of 800° C. or above, is reached. And a steel having 0.85 carbon will resolve into

Austenite at 650° C. It is clearly seen that the lower the carbon content the higher must be the temperature to produce the same effect; it is evident that the eye expert cannot determine this.

Every steel should be investigated to determine its thermocritical points, *i. e.*, the points where the constituents pass from region to region. These may be determined in a small handy furnace, with pyrometer fitted, and a time-temperature curve established as shown below; the curve is not exact, being intended merely as an illustration. The horizontal parts of the curve occur at temper-

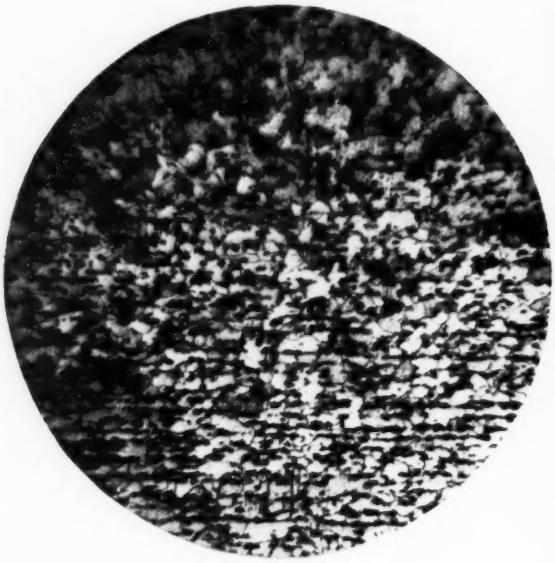


FIG. 7.—BOILER TUBE

atures coincident with the changes of structure shown in Fig. 8 and are due to a phenomenon allied to that of latent heat in the change from steam to water, water to ice, etc.

The steel worker is now in possession of facts which enable him to handle his heat factors intelligently and produce the results desired. Microscopic examinations keep him informed and photomicrographs make a perfect record of his finished product.

It is hoped that this brief account will serve to show the means whereby our ships are now being made structurally safer, our engines more dependable, and our guns perhaps of longer life.

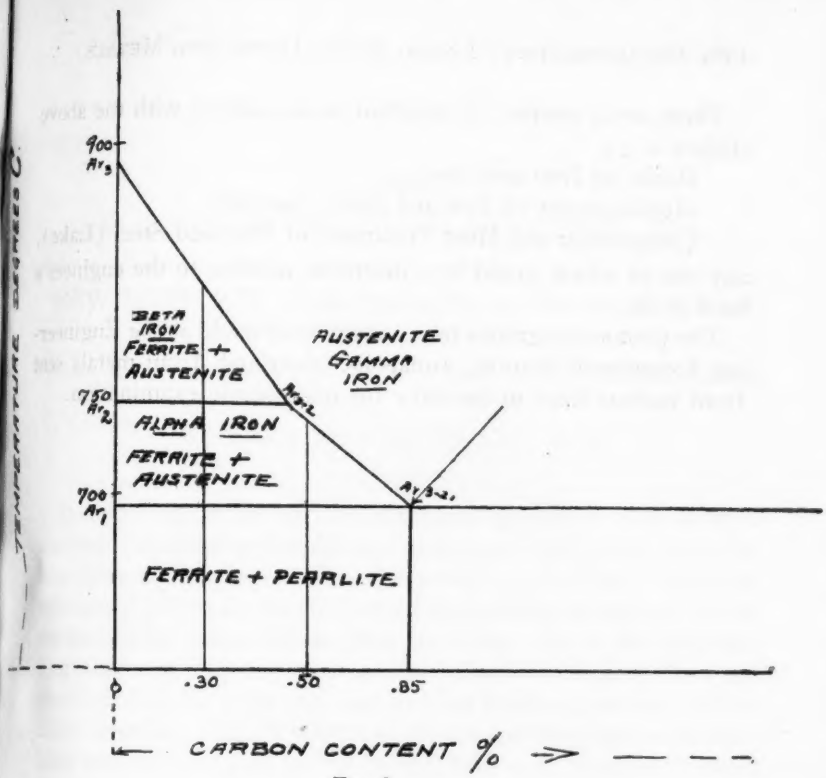

TEMPERATURE DEGREES C.
900
Ar3
BETA IRON FERRITE + AUSTENITE
AUSTENITE GAMMA IRON
750
Ar2
ALPHA IRON FERRITE + AUSTENITE
700
Ar1
FERRITE + PEARLITE
.30
.50
.85
CARBON CONTENT % →

FIG. 8

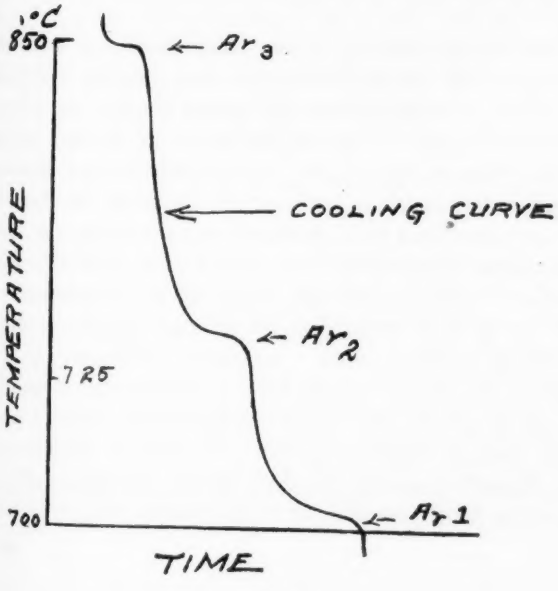

°C
850
Ar3
COOLING CURVE
Ar2
725
700
Ar1
TEMPERATURE
TIME

FIG. 9

There are a number of excellent books dealing with the above subject, *e. g.*,

Howe on Iron and Steel,

Metallography of Iron and Steel (Sauveur),

Composition and Heat Treatment of Iron and Steel (Lake),

any one of which would be a desirable addition to the engineer's book shelf.

The photomicrographs here shown were made at the Engineering Experiment Station, Annapolis, Maryland, from metals sent from various ships in the navy for microscopic examination.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NEW LIGHT ON THE "BLOOD IS THICKER THAN WATER" EPISODE

(From the private papers of the late Rear Admiral Stephen Decatur Trenchard, U. S. Navy.)

By EDGAR STANTON MACLAY, A. M.

It is doubtful if any international naval episode of modern times has made a more profound and permanent impression than the impulsive act of Captain Josiah Tattnall, U. S. Navy, in giving substantial aid to the sorely pressed English forces in their attack on the Peiho forts, China, June 25, 1859. As a distinguished Englishman of that day recorded: "Gallant Americans! You and your admiral did more that day to bind England and the United States together than all your lawyers and pettifogging politicians have ever done to part us." Looking back over a period of more than half a century, we can appreciate the accuracy of this statement.

Potential as this episode was in its influence on the American and English peoples, it is a singular fact that few incidents of this nature in our navy's career are so little known to the American public as Tattnall's gallant act during the allied French and English attack on the Peiho forts. In a large measure, this is owing to the lack of detailed information on the subject. In a general way, we have known that Tattnall gave expression to the words, "Blood is thicker than water," and, ignoring his neutrality, dashed to the assistance of the allies, but the incidents leading up and subsequent to, and having an important bearing on his exploit, have long remained unknown. These highly significant details have been found in the private papers of the late Rear Admiral Stephen Decatur Trenchard, who, as a lieutenant in the navy, was an eye-witness to, and an active participant in, this dashing episode. Through the courtesy of Mr. Edward Trenchard (son of the late admiral), these papers have been placed in the hands of

the writer, and with the new light thus brought to bear on this international incident, it is believed that the following is the completest account of it yet published.

I

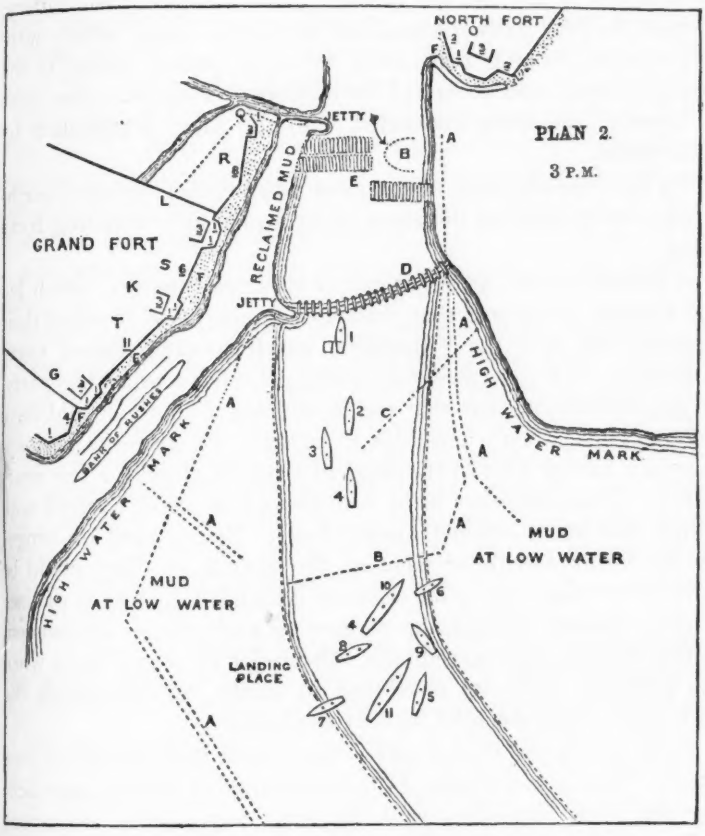
In the year 1858 England extorted from China (virtually at the cannon's mouth) a treaty that was extremely distasteful to the dominant faction in the court at Peking. With a view to preventing the ratification of this treaty, the Chinese constructed formidable earthworks and barriers at the mouth of the Peiho. Indeed, so admirably were these obstructions arranged that the English freely expressed the suspicion that they had been engineered by Russian officers, and, during the battle, had to a large extent been manned by "convicts swept up from the Siberian frontier."

These fortifications and barriers are described in the Trenchard papers as having been of a most formidable character. The Peiho (North river) for most of its short course is a rapid stream, cutting a channel through the alluvial Pechili plain; but as it nears the sea it flows for the last five miles through a low, flat country scarcely above river level. In this stretch of its course the stream spreads out at high tide so as to lose much of its velocity.

The bar is a hard clay bank which, at low tide, is covered by only two feet of water, flanked by broad stretches of mud flats, but the unusual height of the tides on this coast increases the depth on the bar to eleven feet.

A little more than a mile above the bar, where the river banks rise abruptly to a considerable height, the Chinese had erected fortifications. These were constructed of mud, faced with solid masonry, and occupied the site of the earthworks destroyed by the English and French in the preceding year. As one looks up the river there were three mounds of earth, faced with stone, each thirty feet high, crowning the elevation on the left bank. On top of these mounds was a level space on which three guns were mounted. These cannon, pointing down stream, could be handled with comparative security from anything like a horizontal fire on account of their elevation.

Flanking these mounds were heavy mud batteries, twenty-two feet high, which were arranged so as to protect the base of the mounds from a breeching fire. These flanking batteries mounted casemate guns and were connected into one great work by a series of curtains pierced for casemate guns and were protected from a



PLAN OF THE BATTLE OF THE PEIHO FORTS—JUNE 25, 1859
Found in the private papers of the late Rear Admiral Trenchard, U. S. N.

REFERENCES

A.A.—Piles driven closely together in the mud.

B.—Barrier of iron stakes, almost covered at high water.

C.—Chains and cable, stretched partly across the river; supposed to have been carried away by the tide before the attack.

D.—Boom of heavy timbers stretching partly across the river.

E.—Massive timber raft stretching partly across the river.

F.F.—Pointed stakes about two feet high, driven closely to the ground.

(1) *Plover*, flagship, (2) *Opossum*, (3) *Lee*, (4) *Haughty*, (5) *Forester*, (6) *Banterer*, (7) *Starling*, (8) *Janus*, (9) *Kestrel*, (10) *Cormorant*, (11) *Nimrod*.

flank attack by dry and wet ditches. This was the Grand Battery, pierced for fifty guns. Above and below the Grand Battery were two waspish-looking forts, each having a mound similar to the Grand Battery and protected by bastions. They had three tiers of cannon and were connected with the main fortification by earthworks.

On the opposite bank of the river was another series of earthworks constructed on the same general plan and mounting forty guns.

A feature in the arrangement of these earthworks, which led the English to suspect that Russian engineers had directed their construction, was the "mantlet" which covered almost every embrasure and concealed the opening from an attacking party. It was indeed singular that the slow-going Chinese should have adopted this (then) new idea in military defense—its first appearance having been at the siege of Sebastopol, only a few years before. These mantlets were stout frames of wood, covered with rattan and proof against musket balls. Being hung on hinges on the lower and outer edge of the embrasure, they could be lowered or triced up, as the occasion demanded, by means of lines leading upward through the parapet on each side of the cannon. When closed it was exceedingly difficult for an enemy, even when the parapets were not enveloped in smoke, to distinguish the embrasure from the solid wall of the battery.

Long before the British and French made their attack on June 25, the Chinese had obtained the exact range of vessels approaching the forts. By this means, the guns were loaded and aimed before the mantlet was lowered. Everything being in readiness, the mantlet was dropped, the gun run out and discharged—the recoil sending the gun back again and automatically drawing up the mantlet. This could be done so quickly that it was almost impossible for an enemy to determine out of which embrasure the gun had been fired.

Furthermore, the Chinese in this battle had something else that was entirely foreign to their style of warfare, namely, relays of guns to replace those dismounted. During the cannonade of June 25 the allies dismounted a number of the Chinese cannon and were considerably perplexed on discovering, a few minutes afterward, that other cannon were being fired from the same embrasures.

Besides these land fortifications, the Chinese had constructed three lines of barriers across the river. The first, about 550 yards from the center of the Grand Battery and about 900 yards from North Fort, consisted of a single row of iron stakes, each having a tripod base nine inches in diameter. The tops of these stakes were pointed, besides which there was a sharp spur capable of penetrating the hull of a wooden vessel ascending the stream: and they were driven so deeply into the clay bottom of the river that their tops were covered at high water—a condition of the stream which gave the only promise of success to an attacking party.

About 450 yards above this was another barrier consisting of a rope, eight inches in diameter, and two heavy chains, stretched across the river—there being a distance of twelve feet between the rope and the chains. At a distance of every thirty feet these chains and the rope were supported by heavy spars, each of which was carefully moored up and down stream. The rope and chains had been hove in as tightly as possible, which probably caused them to part under the strain so that, at the time of the attack, this obstruction stretched over only half of the river, and in a diagonal direction.

But, possibly, the most formidable barrier of all, was the third one which stretched across the river directly under the guns of the Grand Battery and North Fort. This obstruction consisted of two massive rafts of rough timber, lashed and cross-lashed in all possible directions with ropes and chains. They jutted out from opposite banks of the river, their ends interlaping; and being anchored within a few feet of each other, a passing vessel was compelled to take a course in the shape of the letter S. Just north of the right-hand raft was a circular line of iron stakes which were covered at high water, and calculated, with all the nicety of Chinese cunning, to entangle any craft attempting to force a passage.

Formidable as were these fortifications and barriers, they were rendered doubly so by the fact that the English and French were entirely ignorant of their elaborate nature. Only the year before the allies had found little difficulty in knocking to pieces the mud forts the Chinese had constructed at the mouth of the Peiho, and they advanced to the attack on June 25, 1859, under the impression that they would encounter no more serious opposition than in the year before.

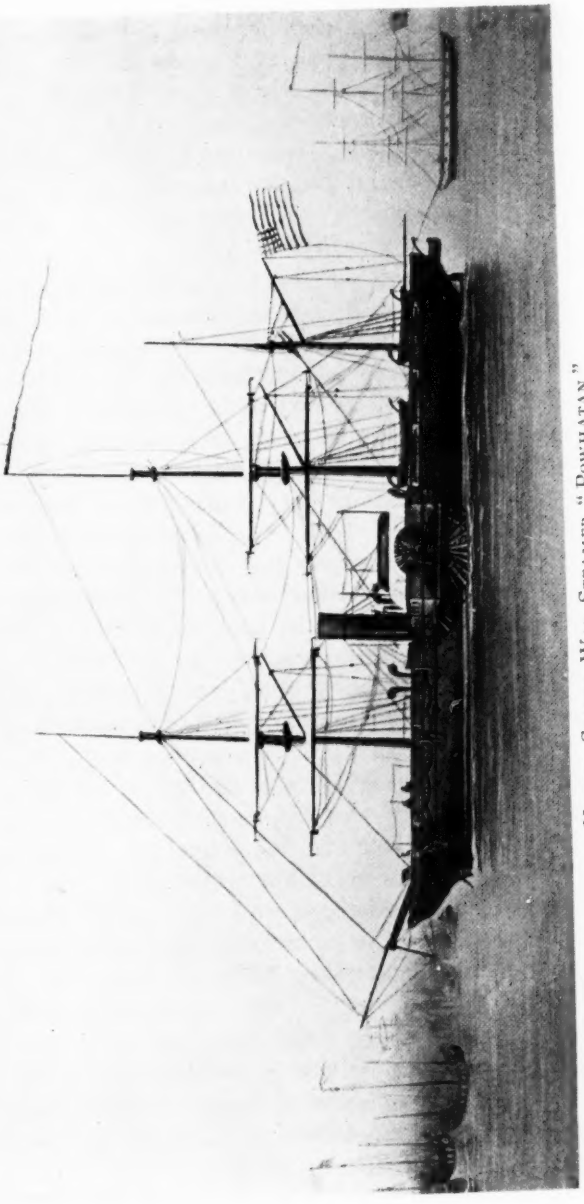
II

In order that we may fully appreciate the significance of the "Blood thicker than water" episode, we must revert to the Trenchard papers, dealing with the summer of 1858, which throw a most interesting light on the incident. From these papers we learn that the battle of the Peiho forts (so far as several hundred American and British man-of-warsmen were concerned) began in Queen street, Hong-kong, a year before the final action on June 25, 1859.

On December 7, 1857, the U. S. war steamer *Powhatan*, Captain George F. Pearson (familiarly known in the service as "Honest George"), having Lieutenant Stephen Decatur Trenchard as her executive officer, sailed from Hampton Roads for the China station via Cape of Good Hope. She arrived at Hongkong May 12, 1858. At this port twenty-four hours' liberty was granted to the major portion of her crew and Trenchard records in his diary: "Before the men went ashore they learned that it was best to keep elbow touching elbow, and that it was sometimes a stern necessity to fight. Each man was supplied with a sufficient amount of current coin to enable him to have a good time; and away they went as full of the spirit of fun and frolic as little children."

In port at this time were the British warships *Chesapeake*, Captain G. Willes, and *Highflyer*, Captain C. F. Shadwell. It happened that on the day the *Powhatan's* crew had shore leave, half of the *Highflyer's* crew also had liberty. In the course of the afternoon, when the Yankee tars had arrived at a peculiarly genial frame of mind, they chartered, through the agency of Bumboat Sam, the ever-present Chinese comprador, all the sedan chairs that could be secured and formed a procession in Queen street with a view to seeing the town in "proper" style.

At that moment, just as the procession of sedan-chairs (each containing two American sailors) was starting off, the Highflyers appeared. Trenchard records: "The novelty of the thing immediately took the eye of Johnnie Bull and, after the chairs had started and trailed out nearly a quarter of a mile with the Chinese bearers grunting their usual ditty and the Yankees singing 'The Star Spangled Banner' and other patriotic songs, the Englishmen could not refrain from complimenting the dash and ingenuity of their cousins."



UNITED STATES WAR STEAMER "POWHATAN"
From a photograph taken in Chinese waters in 1859.

Without doubt the procession would have passed the Highflyers without unpleasant incident had not one of the Yankees shouted out to a group of English sailors: "Hey: You d—d lemon squeezers, parbuckle yourselves out of our way and trice up the slack of your lip: D'ye hear?" This exclamation was unfortunate, as it happened that Colonel Lemon commanded the British marines on the China station at this time and he had proved a popular officer, not only with the men immediately under him, but with the seamen as well.

The Highflyers who heard the remark about "lemon squeezers" naturally took it as a reflection on their beloved Colonel Lemon. The words acted like a spark in a powder magazine and in an instant the sedan chair containing the American who had made the unfortunate remark was upset and the occupants spilled out. Naturally a rush was made by the main body of Highflyers and naturally the Chinamen abandoned their sedans and fled.

As might be expected of "true and tried" Yankee man-o'-warsmen, they rallied to the support of their unfortunate shipmate who had "handed out" the "undiplomatic" remark about "Lemon." Trenchard records: "At it they went, and a regular knock-down affair existed for fifteen minutes. For a while the Americans made a good show, but half a dozen boat crews reinforced the English and the Yankees were forced to retire to a tea garden for reorganization and to repair damages."

Having "patched up" as best they could, the Americans returned to the "battle" and went at the Highflyers in "regular orthodox style." Possibly zest was added to this land "naval action" by the fact that one of the British warships in the port of Hong-kong at that time was named *Chesapeake,* after the frigate of that name captured by the English on June 1, 1813, off Boston harbor. It is within nature to believe that the Highflyers, on this supreme occasion, did not fail to remind the Powhatans of this unpleasant (to Americans) historical fact. Then, again, there was an English war vessel named *Highflyer* which was captured, also in the war of 1812, by the United States 44-gun frigate *President,* and it is equally probable that the Powhatans did not fail to remind their antagonists of that equally unpleasant (to Britons) fact.

But whatever was the fuel added to this uncousin-like strife, it is of record that it lasted most of that afternoon. Late in the

day a strong detachment of Yankees drove in the Highflyers' pickets and brought about another general engagement. Local police were powerless to stop the "carnage" and, as a last resort, a company of British soldiers was ordered out of the garrison to assist in restoring order. "The sight of the redcoats," records Trenchard, "acted like oil on the fire." However little American and English sailors loved each other, they mutually entertained a most cordial dislike for anything in the shape of a marine or soldier. The instant the cry was passed that the redcoats were coming, the Yankee and English tars forgot that they were fighting each other and joined forces against the "common foe."

At the outset the soldiers were severely handled by the united seamen, but when "driven to the wall," the former loaded with shot. Realizing that it was hopeless to fight against "cold lead," the American and English sailors beat a precipitate retreat around a convenient corner and, retiring to a distant part of the town, "fought out their own little difficulty to their hearts' content." Trenchard records: "Next morning the crew of the *Powhatan* returned on board—and they were a sight to behold. Almost every man of them had his nose cock-billed to starboard and a sprinkling in here and there of rickety-looking eyes that would have done credit even to the famous Donnybrook Fair. It took two or three days for the men to recover from the soreness and for some months after that it got to be quite the proper thing to thrash an English sailor on sight." Indeed, the outcome of that Queen street fight became so serious that it was deemed advisable for the *Powhatan* to change her port and she went to Penang.

This was the "first act" of the famous "Blood is thicker than water" episode, as revealed in the Trenchard papers. How the crews of the *Powhatan* and the *Highflyer* acted when they again met at the mouth of the Peiho, a year later, will now be related from the same papers.

III

Having touched at several ports in China and Japan, the *Powhatan*, on June 20, 1859, appeared in the Gulf of Pechili, having on board John E. Ward and suite to represent the United States in the impending negotiations. Here Flag-Officer Tattnall found the allied English and French forces, under the command

of Admiral Sir James Hope, which had just arrived. In this squadron was the new British Minister to China, Mr. Bruce, and by the terms of the treaty he was obliged to appear in Peking on or before June 26, for the ratification.

The allied forces consisted of the following: Outside the bar and incapable of crossing it—the English flagship *Chesapeake,* Captain G. Willes; *Magicienne,* Captain N. Vanstittart; *Highflyer,* Captain C. F. Shadwell; *Cruiser,* Commander J. Bythesea; *Fury,* Commander Commerell; *Assistance,* Commander W. A. Heath; and *Hesper* (storeship), Master Commander Jabez Loane; the French corvette *Duchayla* (aboard which was the French Minister, M. Bourbollon), Commander Tricault; and the tender *Nosegay.* Vessels capable of crossing the bar and those which took active part in the battle—*Nimrod,* Commander R. S. Wynniatt; *Cormorant,* Commander A. Wodehouse; *Lee,* Lieut. W. H. Jones; *Opossum,* Lieut. C. J. Balfour; *Haughty,* Lieut. G. D. Broad; *Forester,* Lieut. A. F. Innes; *Banterer,* Lieut J. Jenkins; *Starling,* Lieut. J. Whitshed; *Plover,* Lieut. Commander Hector Rason; *Janus,* Lieut. H. P. Knevit; and *Kestrel,* Lieut. J. D. Bevan. Each of these gunboats carried two 18-pounder howitzers, with the exception of the *Cormorant* and *Nimrod,* each of which mounted six guns of that caliber—making a total of thirty 18-pounder howitzers and a combined rocket battery of twenty-two 12 and 24-pounders. The total number of officers and men manning these gunboats was about five hundred, besides which there was a detachment of six hundred marines under Colonel Lemon, which was held in reserve. The *Nosegay* and *Coromandel* were anchored beyond gunshot for hospital service.

It was in the stillness of night that the allies arrived at the mouth of the Peiho. The roaring of escaping steam and the clattering of chain cables running through iron-faced hawseholes aboard the warships aroused the Chinese. But they did not seem to be in the least perturbed by the arrival of such a formidable force of "red headed barbarians." As day broke, they gazed upon the armada in stolid indifference; and then went about their accustomed duties. There was nothing about the place to indicate that unusual preparations had been made to resist the "foreign devils." To be sure, obstructions were plainly visible across the river, but these, the officials declared, had been placed to keep out pirates and rebels, who recently had been giving the

Imperial Government trouble. So far as the on-looker could determine, everything about the mouth of the Peiho was as quiet and sleepy as the most enthusiastic admirer of Chinese river scenery could desire.

As the officers and men paced the decks of the war vessels, the course of the Peiho could be traced far into the interior by the masts and sails of junks that moved sluggishly up and down that stream. The straggling village of Taku, glimpses of which could be obtained behind the fortifications, seemed to be pursuing its usual lazy, monotonous existence as a fishing hamlet. The tower of Little Temple, from which the Governor-General of Pechili had fled the year before, with its succession of quaint, peaked roofs, was seen just beyond the fort on the left.

For the first time in the experience of foreigners, a Chinese military post was lacking in the usual lavish display of flags and tents—denoting the presence of troops. A yellow, triangular flag trailed its sluggish length out from each of the two mounds and a few officials of "low rank" could be seen moving among the batteries as unconcernedly as if the "foreign devils" were on the other side of the globe. Small detachments of poorly armed and shabbily dressed militia were paraded through the works. Few of the guns in the embrasures, owing to the deceitful appearance of mantlets, could be seen.

As a preliminary step, Admiral Hope, on arriving off the bar, sent a boat ashore to communicate with the commander of the forts and to request that the barriers be removed so the gunboats could proceed up the river. The British officer landed with this message, but was not permitted to proceed farther than the beach, where an official of low rank met him and refused to remove the barriers, saying that the English would meet the proper representatives of the Emperor at another mouth of the Peiho, ten miles northward. This official concluded by saying that he acted entirely upon his own responsibility and that no higher officers were present.

Thus far nothing had occurred to arouse Admiral Hope's suspicions of treachery, as everything had been conducted in an entirely good-natured way on the part of the natives, and the best of feeling had been shown. Exasperated at being balked in his friendly visit to the capital, the British Admiral wrote to the local officials that, if the obstructions were not removed by the evening of June 24, he would force an entrance.

It was while matters were in this condition that Mr. Ward, after consultation with Flag Officer Tattnall, decided to proceed up the river in the *Toey-Wan* (a small merchant steamer, chartered by the Americans for the occasion, as the *Powhatan* drew too much water to cross the bar), as if ignorant of the Chinamen's refusal to allow the English and French to pass; and if the forts fired across the *Toey-Wan's* bow, he would anchor and communicate. But if they fired *into* his steamer, which was unarmed, he would retire.

Accordingly, at 11 a. m., June 24, the little *Toey-Wan,* displaying American colors, steamed through the allied fleet without communicating and pushed boldly up to the first barrier. So far as any one aboard the foreign craft could discover, the fortifications were deserted. Not a man nor a gun in an embrasure was visible and, although there were flagstaffs aplenty, not a flag was in evidence.

When about three hundred yards from the first barrier, the *Toey-Wan* struck some obstacle in the river which caused her to tremble from stem to stern. She had run on the treacherous bank of the stream which was visible at low water but entirely concealed by the murky waters at high tide. Efforts to back her off were unavailing, while the fast falling tide rendered her position extremely critical, for not only was she entirely at the mercy of the batteries, but the ebb tide was leaving her partially on the edge of the bank so that by low water she must tumble off and fall into the river upside-down.

Observing the difficulty the Americans were in, Admiral Hope sent the *Plover* to their aid with permission to Mr. Ward to hoist American colors over her if desirable. The *Plover* endeavored to pull the *Toey-Wan* off, but the cable parted, whereupon the admiral dispatched his flag-lieutenant with another gunboat—but even their united efforts were unavailing.

It was while the *Toey-Wan* was in this critical position that Tattnall sent Lieutenant Trenchard with interpreters to the nearest fort to inform the officers in command that the American Minister was aboard the stranded steamer. Trenchard records the incident in his journal as follows: "I was dispatched in the barge by Flag Officer Tattnall as his representative, accompanied by Dr. Williams and the Rev. Messers. Martin and Atchinson, our interpreters (the former as representative of Mr. Ward), to

communicate with the officer in command of the fort. We passed inside of the lines of the stakes and landed at the extremity of a mud jetty, running out of the central bastion on the left, and below the lower barrier. We were received by a guard of twenty men armed with spears, double swords and long knives. They were rather ragged in appearance. Mr. Martin and myself held

LIEUT. STEPHEN DECATUR TRENCHARD, U. S. N.
(Late Rear Admiral)
From a photograph taken on the China station at the time of the Battle of the Peiho Forts.

an interview with the officer. It was, in substance, that we had come here for the purpose of going up the Peiho river to Peking with our Minister, who had been directed to see the Emperor; and to deliver to him in person a letter from the President of the United States and to ratify the treaty. The commissioners at Shanghai said there would be difficulty in passing up the river to

Peking and that instead of finding it clear we would meet obstructions placed in the channel. We requested that these obstructions be removed so that we could pass up the river. The mandarin or head man of the party stated that the barriers could not be removed; that they had been placed there to protect the villages against rebels and pirates; and that any attempt made to remove them would be resisted and the forts would open fire." It was with such unsatisfactory answer that Trenchard returned to Flag Officer Tattnall. After many exertions, the *Toey-Wan* was released from her perilous position and resumed her station outside the bar.

IV

It was not until June 23, that the gunboats were taken across the bar and on the night of the 24th Admiral Hope sent three boats up the river under the command of Captain Willes to remove the barriers. Forcing his way between the line of iron stakes, Willes left two of his boats at this place with orders to attach explosives for the purpose of blowing up the obstruction. With his remaining boat, Willes pulled up to the third barrier.

At this point, Chinese sentinels could be seen pacing up and down the parapets, but they paid not the slightest attention to the visitors, although the latter were plainly visible. After a careful investigation of the rafts, Willes was satisfied that it was impossible for the gunboats to remove them; so, returning to the second barrier, he exploded his cylinders and made a breach wide enough for the gunboats to pass. At this moment several guns from the forts were carelessly fired as a warning for the foreigners to desist; but no general alarm seems to have been given and the formidable character of the batteries was not revealed. Evidently, it was the intention of the Chinese to lure the foreigners into a trap. On the following morning the British discovered that the breach had been repaired.

The same deceitful calm prevailed in and around the fortifications at daylight, June 25. At 3.30 a. m. the boatswains' whistles in the allied forces began their merry chirping, sending all hands to breakfast. Half an hour later the gunboats were taking their prescribed positions.

By this time a strong flood-tide was running—a muddy, turbid stream up a tortuous, ill-smelling gutter. Gradually that gutter was filled and the thickened waters, ruffled by a fresh breeze

which blew the foul odors toward the forts, began to rise to the level of the mud banks and finally lapped over them. Soon the increasing flood of in-rushing waters spread over the reed-covered mud-flats, concealed them completely from view, and began to wash against the massive foundations of the forts.

Operations had been started thus early in the day in the hope that the gunboats would be in position by high tide. But delays were occasioned by the narrowness of the channel and by the strength and unfavorable direction of the wind. Delay also was caused by the grounding of the *Banterer* and the *Starling*, so it was after noon before the vessels had reached their destinations.

At 2 p. m., when the ebb-tide was running swiftly, Admiral Hope, having his flag on the *Plover*, signaled the *Opossum* to remove an iron stake to which she had made fast. The stake was wrenched from its bed after thirty minutes of hard tugging by the gunboat and the allied vessels passed through the breach thus made and passed up to the second barrier, where they were directly under the guns of the fortifications; and still no hostile demonstration had been made from the shore. It was a moment of intense excitement. Every eye was fixed upon that long line of silent earthworks.

At the moment the flagship *Plover* was endeavoring to break through the second barrier, however, a single gun was fired from the Grand Battery and in an instant all the mantlets were dropped and ninety cannon belched forth their roaring protest against the little craft. Admiral Hope now signaled, "Engage the enemy as closely as possible," which brought the other gunboats to the support of their gallant leader.

It soon became apparent that the Chinese, long before, had acquired the exact range on that section of the river between the barriers, for many of their shot took effect on the *Plover* and *Opossum*—the leading gunboats. Indeed, it seemed to be the enemy's object to annihilate the flagship, for within twenty minutes the *Plover* and *Opossum* had so many of their men killed or wounded that their guns were almost silenced. Among the first to be killed was Captain McKenna, of the admiral's staff. About the same time, Lieut. Commander Rason, of the *Plover*, was cut in two by a round shot, while the admiral himself was severely injured in the thigh. For the first time in European experience in Eastern waters, the Chinese were discharging firearms without

closing their eyes. It was painfully evident that now they were selecting definite objects to hit and were deliberately aiming their cannon, with open eye, at said objects—another evidence, so the English believed, that Russians were in the fortifications directing the proceedings.

Flag Officer Tattnall and other Americans in the *Toey-Wan* (anchored in the river just out of gunshot) had been witnessing the treacherous attack on the gunboats with feelings of mortification and anger. Trenchard, in his diary, records that Tattnall finally exclaimed: "Blood is thicker than water," and that "He'd be damned if he'd stand by and see white men butchered before his eyes. No, sir: Old Tattnall isn't that kind, sir. This is the cause of humanity. Is that boat ready? Tell the men there is no need of side arms."

Realizing that it was impossible for the British reserves to advance against the swift current to the relief of their sorely tried brethren, Tattnall sent an officer to Colonel Lemon offering the services of the *Toey-Wan* in towing him into action. At this moment the Americans observed a boat emerge from the smoke of battle and pull with desperate energy toward the *Toey-Wan*. Quickly she ran alongside and a British midshipman climbed up the man-ropes and proceeding aft, handed a dispatch to Flag Officer Tattnall. The American commander became greatly excited on the perusal of the note and he immediately got into his barge with Lieutenant Trenchard to "pay an official visit" (as Tattnall expressed it) to the British admiral.

Away went the barge over the waters, rendered doubly murky by the smoke and grime of battle, closely followed by the English boat—both craft soon being lost to view in the dense volumes of smoke that enveloped the combatants. While the Americans were passing a gunboat that was suffering severely from the Chinese fire, a shot plowed through the Stars and Stripes floating at the stern of Tattnall's boat, and left them a collection of streamers.

As the barge passed other gunboats their crews cheered, but scarcely had the first cheer been given when another shot struck the barge's quarter, instantly killing Coxswain Hart and wounding Trenchard, besides badly injuring the boat, so that it was only with the greatest difficulty that it was kept afloat long enough to reach the side of the British flagship. On gaining the quarter

deck, Tattnall found Admiral Hope sitting on a camp stool, desperately wounded but still directing the fight. Everything about the gunboat indicated the terrific fire she was being exposed to. Forward was an 8-inch gun with only two men near it —the rest of the crew having been killed or wounded and the reserves exhausted.

Trenchard describes how Tattnall, after exchanging a few words with the admiral, turned to his own boat's crew and said: "Meantime, my good fellows, you might man that gun forward until the boat is ready; just as you would in your own ship." These Yankee tars (who only a few months before had been engaged in a savage fist-fight with some of these English sailors in Queen street, Hong-kong) went forward. A bright English lad, twelve or thirteen years old (one of the few survivors of the original gun crew), offered to supply them with powder and shot. Throwing off their superfluous clothing the Yankee tars entered into the fight in earnest and for nearly an hour fired that gun—declaring that "every shot hit the mark."

At the end of the hour they were relieved by a boat-load of English sailors from another gunboat and, walking aft, they were confronted by Lieutenant Trenchard. Their powder-begrimed faces and heated appearance told plainly enough what kind of work they had been engaged in, but realizing the neutral position of the United States, Trenchard affected a severe tone and asked what they had been doing. One of the brawny tars coolly replied: "Oh nothing much, sir, excepting lending a friendly hand to them fellers forward." By this time another boat had been secured for the Americans and they returned to the *Toey-Wan*.

After the battle had progressed several hours with more and more evident disadvantage to the gunboats, Flag Officer Tattnall realized that the allies must speedily have the support of their reserves or be overwhelmed with disaster. Accordingly, he took the junks in tow and, unmindful of the danger he was incurring or the neutrality of the nation he represented, he brought them into action.

These reserves, six hundred strong, were at once landed to storm the forts as a last hope. They rushed madly down the ditch filled with water and rendered almost impassable by sharp stakes. They threw their scaling ladders across the ditch and continued to advance in spite of the terrific fire at close quarters.

Some were actually beginning to climb the masonry when, suddenly, the cry "Russians" was raised. Thoroughly discouraged, the assailants, in spite of the efforts of their officers, retreated to the beach and scrambled into their boats—all the time being exposed to a destructive fire.

But there were not enough boats to take them off. It was a terrible moment and here, again, Tattnall won the lasting gratitude of the English. He ran his light-draft *Toey-Wan* close inshore and took the fugitives aboard, thereby saving many lives. In this unfortunate affair of the Peiho forts, the allies sustained a loss of 89 killed and 345 men wounded.

But even here, the kindness of the Americans did not cease. A day or two after the battle, Chinese officials sent aboard the *Powhatan* twenty sheep, the same number of hogs, one hundred and forty chickens, sixty ducks, 250 pounds of vegetables, 250 pounds of fruit, 2500 pounds of flour and 2000 pounds of rice. Unknown to the natives, the Americans sent these most acceptable gifts to the English and French, many of whom had been desperately wounded and had been without food for thirty-six hours.

An English eye-witness of this battle recorded: "Many of our men slept in the American tender [*Toey-Wan*] on the night of the fight. Cigars, coffee, brandy—everything a man could want—were placed before them. The American crew forgot themselves and thought only of the British. A few days after the fight, a Chinese junk with a flag of truce brought fresh provisions to the *Powhatan*. These were immediately sent to our wounded. The bond of American brotherhood was deeply cemented in our trial at the Peiho. I believe there was not a man in the fleet who did not feel it growing up within him and, I am sure, there are thousands, if I may not say millions, on both sides of the Atlantic who will join me in the fervent wish that that feeling of brotherhood may take deeper and deeper root in both lands."

V

In the following December, 1859, the *Powhatan* again visited Hong-kong—the scene of that memorable Queen street fight between the American and British man-of-warsmen only a few months before. This time it was not found "desirable" for the American flagship to "change her port" owing to the former

conflicts between her sailors and English man-of-warsmen in the streets of Hong-kong.

On the contrary, Trenchard describes her reception as having been most cordial: "As she [the *Powhatan*] steamed to her anchorage, she passed the British flagship *Highflyer*. As soon as the *Powhatan* was recognized, the British band struck up 'Should Auld Acquaintances be Forgot' and 'Columbia, the Gem of the Ocean.' Then the *Highflyer* ran up the American flag and the *Powhatan* hoisted the British flag, and salutes were mutually fired. Then the other British vessels in the harbor hoisted the Stars and Stripes and saluted. Soon after, the Russian frigate saluted our flag and the French warships also. The English and American sailors made excursions on shore together, and the former always stood ready to help an American out of a difficulty.

"On Christmas following, the American and English sailors made up a purse of eight hundred dollars and sent for Bumboat Sam (he of the sedan-chair fame) to have him cater to them in a way that would be an everlasting honor to his vocation. Sam promised to furnish everything in the air, the ocean and on earth. He was true to his word and two long tables were spread with fowl, fish, flesh and fruit. Afternoon brought the guests from the English ship and the viands were flanked by the attacking party, headed by the officers. Our executive officer made a little speech. Speeches, toasts, cold water, jests and story had place in the order of the hour; and no one for a moment would have thought that the two crews, a year before, had been engaged in pounding each other's faces after the most approved style of prize-fighters.

"Next summer, when we were down at Penang, the *Powhatan's* crew got leave of absence for forty-eight hours. The *Highflyer* was there also. The two crews hobnobbed famously, and got up an excursion to a noted resort some six miles distant. The sailors hired coaches and saddle-horses, took along baskets of pop-beer, stout, claret, oranges, sardines, hams, herrings, etc. Every man carried a 'Penang lawyer.' The men started along the shell road and in due time reached their destination; and everything was joyous during the entire leave of absence."

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A QUESTION IN DISCIPLINE

By LIEUT. COMMANDER T. D. PARKER, U. S. Navy

The words "discipline" and "system" suggest Dr. Johnson's definition of the poet Gray—"A dull fellow, Sir, in a minute way." They certainly bore the average workman or sailorman to tears. But as military life is founded on "bromides," I offer a note on a particular feature of discipline in the navy, with the apology that both diagnosis and remedy are based on years of looking and thinking in service.

I refer to the handling of small sins of omission and commission at sea. On the average sea-going ship the captain has no time or inclination to deal with them. He has small sympathy with the young officer or the enlisted man who appeals to "the law of the ship" and tries to make the skipper of a dreadnought waste his talents as a judge in equity. He wants results. He arouses enthusiasm; and when target practice is over speaks not of spots on the deck or hand salutes omitted, but of the splendid spirit shown by the men. The case sometimes makes one think of a post-mortem description in which Jack's little faults are forgotten, his really fine qualities extolled, and a picture drawn that his brother recognizes, yet with a grin.

But in the humdrum of routine the captain wants results *of a smaller kind,* and does not always get them. A gun-pointer who saved the trophy by expert hits per minute is late to quarters. The captain sees it and frowns. The divisional officer says, "Step out, Jenkins," very pleasantly. The water-tender who staid by his boiler when the water was low, comes up in a non-regulation undershirt and throws fruit through a gun-port; "Jimmy-Legs" could not speak roughly to a man like that. Murphy, who broke his hand but won the bout on the *Tennessee,* does not answer when his boat is called away; no one reports him, he's too good a man.

The officer-of-the-deck begins to look a little fagged. Even the chief boatswain's mate seems worn, and mutters something about "having to tell youse fellows three or four times." The executive inquires sharply why this boat is late, and the captain returns angry after shivering on the dock. Finally, something happens. A boat is being hoisted—the regular coxswain is getting a shave—the wrong man passes a stopper, the boat falls and some one is drowned. The small offence has been magnified.

In other words, can we worship the easy-going idol, scorn the minutiæ, pass over small negligences entirely and have a smart or thoroughly efficient ship? Can we even avoid disaster? Is a trophy-winning ship that is dirty, that has "pockets" and "cubby-holes," that has unsuspected defects in machinery due to negligences of good fellows and first-class pointers—is such a ship exactly the *Pennsylvania* that we want?

If the idea of looking for big results only—of getting an extra knot by leaving the bilges dirty, of getting an extra hit, but letting the turret captain lurk in his turret like a feudal baron—is run into the ground, discipline falls low, and even if the ship keeps on, the service may be injured. I have seen both ships and officers thrive on brilliant traits, making reputations for themselves, but pulling down certain laws of the navy.

I realize perfectly that no good can come of pointing out (alleged) defects without remedies. After seeing various ships on which the standard of accomplishment at target practice, or coaling, or full-power runs was high, on which the feeling between officers and men was excellent, *but of which no one could say "this is a smart ship."* I wonder whether this last condition is inevitable.

If a man can hit a target at 12,000 yards, must he require three invitations before he cleans his boat? Is he exempt from saluting his divisional officer, or from rising when the executive passes? Of course, there are ships where these minor offences are few—but such ships are few!

One can hardly advocate frequent petty reports at the mast. The captain's time must not be taken up with trivialities that he cannot investigate in person.

On the other hand, I do not believe that the irregular, illegal, personal punishments inflicted (under other names) by some divisional officers improve good feeling or meet the case.

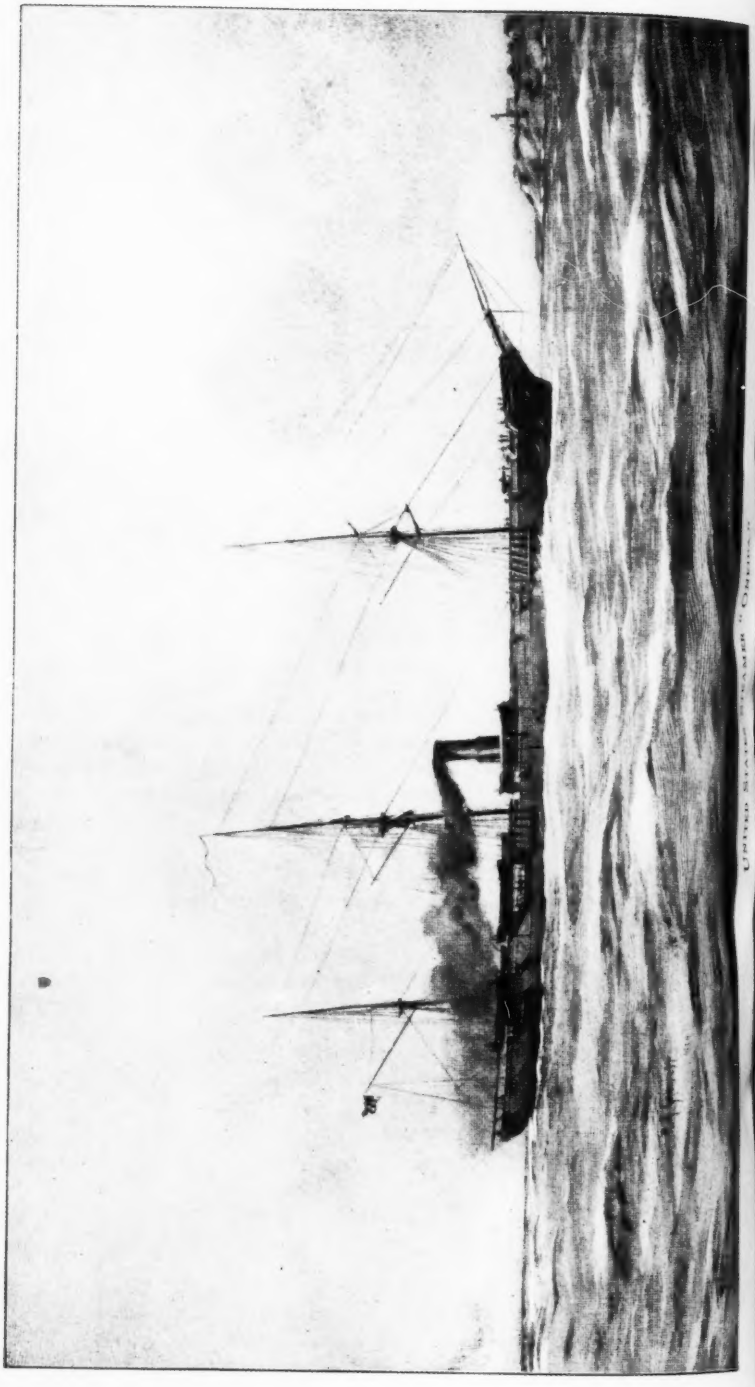
The remedy I propose is to do in the navy what the army has always done. Let the divisional officer, like the company commander, handle his own petty cases. Limit his punishments to extra duty if you please, or let him inflict small fines. Limit the exercise of power so much as his inexperience demands. Let the captain approve his awards. But legalize the disciplinary powers of divisional officers, and the captain's "mast" will be short and serious, minor punishments will be prompt, respect for power will take the place of small resentments, and the navy will have smart ships. Revise Regulations 1428 (1) to read:

He shall have all reports of misconduct investigated before punishment is adjusted. Minor offences may be investigated and punished, subject to his approval, by the divisional officer concerned.

DISCUSSION

A Question in Discipline

COMMANDER W. W. PHELPS, U. S. Navy.—I wish to record my opposition to the proposition of the division officer being authorized to mete out penalties in the case of minor reports among his own division. While both are military services, the navy differs from the army; and on board of a man-of-war the captain only, must be clothed with the power of dealing with offenders, whether the offenses be serious or trivial. Because, on board ship, the men of a division do not work always as a unit; the division must be constantly split up, details working here and there, according to the work in hand, under various officers. I have heard military men say that the army method is not conducive to such uniformity and contentment as follows from our method. In other words, that the variations due to the differing personal equations of company commanders tend to prevent a high degree of contentment. The same would result from the writer's proposal. The writer dwells on *punishment*. It seems to me that it is not punishment that should so much concern the officer as the methods of *prevention of delinquencies*. All the trivial delinquencies the writer refers to are the result of absence of tautness in small details and of failure constantly and repeatedly to exercise patient admonition. To handle these trivial delinquencies it is wrong to think of looking for a method of applying a penalty each time. Constant admonition and correction on the spot will get results in the vast majority of men. The small minority are easy to deal with. The spirit of tautness and efficiency ought then eventually to prevail and become the standard of all hands in smaller as well as in greater things. Every condition on board ship reflects on the captain, and it is not difficult for the captain to greatly diminish the delinquencies to which the writer refers by spending some little time in tracing to their sources the *reasons* for such delinquencies, and applying the remedy *there*.



[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

U. S. S. *ONEIDA*

LOST JANUARY 24, 1870, IN YEDDO (TOKYO) BAY, JAPAN

Reminiscences by
REAR ADMIRAL O. W. FARENHOLT, U. S. Navy, Retired

The *Oneida,* built at the New York Navy Yard in 1861-1862, was a bark-rigged to top-gallant sail, wooden, steam sloop of war of about 1200 tons displacement. She was launched November 20, 1861, and was christened with salt water. Her sister ships in the navy were the *Kearsarge* and *Tuscarora.* In this class may readily be included the *Iroquois, Juniata, Wyoming, Wachusett, Ossipee, Dacotah* and *Mohican.*

These ships differed very little in tonnage, armament and equipment. The greater number were built during the first two years of the Civil War and all of them took an active part in that struggle. At that time they were overarmed. The majority carried two 11-inch Dahlgren pivot guns, with 9-inch smooth-bore guns in broadside, a 100-pounder Parrott gun on the forecastle and howitzers wherever it was believed they would be of most service. The *Oneida* on her last cruise was armed with one 11-inch Dahlgren pivot gun, six 32-pounder smooth-bores, a 60-pounder Parrott rifle gun on the forecastle and several howitzers.

Built at different navy yards these vessels were not identical in appearance, the lines of some being hardly pleasing to a sailor's eye. In the West Gulf Squadron the *Oneida* was known as the "ugly duckling," and with her round, heavy and deep stern made a very squatty and unwarlike appearance, quite different from the fine lines of the *Iroquois* and *Dacotah.*

With the ship's galley on the berth deck, the space for the crew was inadequate, crowded, and badly ventilated; both at sea and in port many of the men had to sleep on the spar deck under

the boom cover. This was the case on the *Oneida* in 1870 even with a reduced complement.

She arrived at Yokohama in November, 1869, from Chemulpo, Korea, via Kobé, Japan. The ship had been on the station almost three years and had received orders to sail for New York via Hong Kong, Singapore and Cape Town. She came to Yokohama to repair her boilers, which were in bad condition, and also to take on board from the *Idaho* the men whose term of enlistment had expired. The latter, a sailing ship, had left for home during the previous September but had been compelled to return, having encountered a typhoon one day out of port, in which she was very severely handled and dismasted to lower masts.

After repairs, the *Oneida* left Yokohama under the command of Commander E. P. Williams, January 24, 1870, at about 5 p. m. The ship was cheered by all the men-of-war in port as she steamed out of the harbor. I was on board to say good-bye to my many friends and shipmates, and as the gangway ladder had been unrigged, I got into my boat over the stern, and thus I was the last person who talked and clasped hands with those poor fellows who were drowned a few hours later.

During the investigation of the collision the rumor was spread that the *Oneida's* officers, homeward bound, were drunk when the ship left the harbor. A more malicious, untruthful statement was never made. I am not only able to refute it from actual observation at the time, but also from personal knowledge of the officers themselves, having been shipmates with many of them at previous times.

Captain Williams had been, and was on the day of sailing, a very sick man. At the advice of the ship's medical officer he had been living on shore, and came on board only a few hours before the ship left port. Lieut. Commanders Stewart and Muldauer, the executive officer and the navigator, and Lieutenant Sargent, the senior watch officer, did not drink or smoke, and Master Yates, the officer of the deck at the time of the collision, was very quiet and abstemious. The latter's actions, before, during and after the collision, undoubtedly proved that he knew what he was about.

About 5 a. m., January 25, I was awakened by a voice shouting in the *Idaho's* dark wardroom, "Get up fellows, the *Oneida*

has gone down!" It was Mr. Dennis Carroll, an American shipchandler, and he said that an hour before Dr. Suddards, the boatswain and five men had come to his house, and had stated that they were the only survivors from the *Oneida* which had been run down off Kwanon Zaki lighthouse by a steamer, that the latter did not stop and that they had landed in Mississippi Bay and walked to Yokohama.

From the testimony given before the two courts of investigation regarding the collision, and from my personal conversations with the survivors of the *Oneida*, I will state concisely what happened after she left port.

Off the lightship, sail was made to topgallant-sails; the ship was on the port tack, wind NE. force 4, and logging between 7 and 8 knots, course S. by E. ¼ E. Everything about the ship was secured for sea and the deck turned over to Master Yates by the executive officer, Lieut. Commander Stewart. At about 6.15 p. m., Yates, believing that the ship was making leeway towards the western shore, sent for the navigator, Lieut. Commander Muldauer, who came on deck and told Yates that he could not go any nearer Saratoga Spit, and directed him to keep his course, from which he had varied several points.

About the same time, an inbound steamer's head and green lights were seen a point on the starboard bow and about three miles distant. Muldauer remarked to Yates, "that steamer will pass to starboard of us, she has the whole of Mississippi Bay to come up in." Muldauer then went below.

When about one-half mile distant and bearing three points on the starboard bow, the steamer suddenly ported her helm as if she wanted to cross the bows of the *Oneida*. Yates put his helm hard a-starboard, but rapidly approaching each other, it was too late for either vessel to escape collision. The steamer, which later proved to be the Peninsular and Oriental mail packet *Bombay* from Hong Kong to Yokohama, was much larger than the *Oneida* and striking the latter ship with her flaring, bell shaped, iron bow forward of the mizzen rigging at an angle of about 45°, crushed the gig, wheel, binnacle, and spanker boom, and cut the starboard quarter almost entirely from the vessel.

Everybody rushed on deck, but perfect discipline prevailed. Captain Williams was assisted by two men from the wreckage in the cabin and lifted on deck through the cabin skylight. His

clerk, Crowninshield, crawled on deck from the cabin through the hole made by the *Bombay*. The executive officer jumped on an arms chest and hailed the steamer "to stand by as assistance was needed." No reply was made by the steamer, which backed out of the hole she had made and was soon lost in the darkness. Three guns were fired from the *Oneida* and her steam whistle kept going until she sank. In spite of this, the witnesses from the *Bombay* testified in court, that they heard "neither guns nor whistle." The guns were, however, distinctly heard by the residents on the Bluff at Yokohama and on board several war ships at anchor in the harbor, 12 miles distant.

On the *Oneida* steam and hand pumps were started and kept going and an unsuccessful attempt was made to throw the battery overboard. Sail was made again in hope of reaching Saratoga Spit and its shallow water, but the ship became unmanageable and settled rapidly by the stern. The remaining two boats, each a ten-oared cutter, the first cutter in the cradle and the third cutter on the port quarter, were cleared away and lowered. Through an unfortunate assumption of authority, Dr. Suddards permitted the third cutter to shove off and search for a junk which several of the crew thought they had seen in the darkness. Had this boat remained near the ship she would have saved many lives. The first cutter, in a rough, choppy sea, after pulling four miles, carried 44 men to the shore. During the passage this overcrowded boat leaked so badly that constant bailing was necessary.

When the water was level with the bridge, Yates urged Captain Williams to get into his cutter, but Williams replied that he would go down with his ship. Yates jumped overboard clothed in a heavy overcoat and was hauled into the boat. He assisted in picking up several other men, and "saw the ship over on the port side, fore-topgallant mast alone visible for a moment, and then disappear." The suction caused by the sinking of the ship was great, and no doubt carried down with it most of the men near by. When the first cutter left the vicinity no one was seen in the water.

The *Oneida* was struck by the *Bombay* at about 6.45 p. m., and sank ten minutes later in 20 fathoms of water, one-half mile to the westward of Saratoga Spit, so named after our sailing sloop of war *Saratoga*, which ran aground on this shoal during the Perry expedition in 1854. The Japanese have erected powerful fortifications on this shoal.

Early on the morning of the 25th of January the commanding officer of the *Idaho* sent an officer on board the *Bombay* to notify Captain Eyre officially of the loss of the *Oneida* and to request him, as his vessel was the only one in port with steam up, to go down the bay and search for survivors. Eyre flatly refused, and added that he "could clear himself of all blame." He made the same refusal to the request of the commanding officer of the British flagship *Ocean*, adding that his vessel was damaged and leaked. When ordered to go by his agent, he steamed down the bay some 12 miles and returned to his anchorage.

The principal injury the *Bombay* had received during the collision was that a piece of a spare topsail yard, which had been lashed under the starboard mizzen chains on the *Oneida*, had penetrated the *Bombay's* port bow close to the stem and three feet above the water line, where, breaking off short it had almost completely filled the hole, but caused the ship to leak slightly in her forward compartment. Slight injuries were also received to the bobstay, headrails and woodwork around the bowsprit. The survey estimated a total damage of $400. If I remember rightly, the *Bombay* was only temporarily repaired at Yokohama.

The Japanese authorities, many persons on shore and all the warships in the harbor offered to the commanding officer of the *Idaho* every assistance in their power. The English gunboat *Sylvia*, the French gunboat *Aspic* and the Russian cruiser *Vsadnic*, the American merchant steamer *Yangtze*, Captain Strandberg, who had served in our navy in the Civil War, got up steam, proceeded down the bay, searched for bodies, and endeavored to locate the wreck. This, however, was not found until January 29, when the truck of the main topgallant mast was seen awash at low water.

The British flagship *Ocean* placed her steam launch at our disposal, and in it the search was continued until the *Arrostock* was chartered. This latter vessel was one of the 500-ton gunboats we had lately sold on the station, their usefulness as warships having ended. The *Arrostock*, officered and manned from the *Idaho* under command of Lieutenant, the late Commander, Tanner, with whom I often alternated, kept up the search for a month but, with the exception of some flotsam, nothing was found.

The first body, discovered on February 5 by a Japanese fisherman 20 miles from the wreck, was that of Captain Williams. The second, on February 12 and near the wreck, was that of Carpenter Pinner. The third and last body, found several weeks later, was that of first-class fireman Reddy. All were buried, and the bodies still remain in the foreign cemetery on the Bluff at Yokohama.

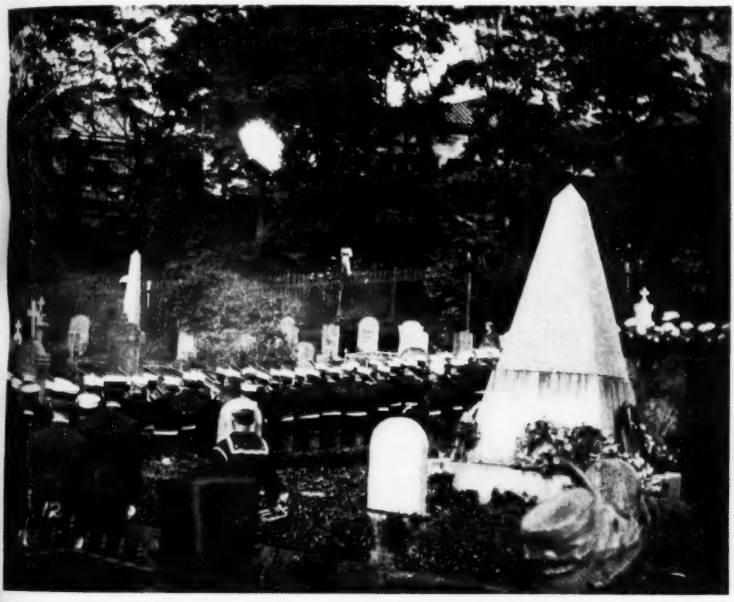
Captain Williams' funeral was the largest and most impressive ever known at Yokohama. Every officer who could be spared from the men-of-war in the harbor, all the members of the Diplomatic Corps, Japanese high officials, a battalion of 500 men of the British Inniskillen Regiment, and almost every foreigner, man and woman, able to walk up that long steep hill to the cemetery, followed the gun carriage with the body. Many warships in the harbor fired minute guns and the British Royal Marines fired the last three volleys over the grave.

A large pyramidal monument, paid for by the officers and the men who served in the Asiatic fleet at that time, marks the spot. On the four faces of the stone the names and rank of the lost officers are inscribed, also the number of the enlisted men in their various ratings. The grounds and monument are lovingly cared for by the officers stationed at our Naval Hospital near by, and whenever one of our vessels is in the bay on Decoration Day, a party is landed and the usual ceremonies carried out.

The indignation of the residents at Yokohama when the first news of the tragedy was learned, and for many days thereafter, was very bitter against Eyre and there was talk of lynching him. The British Minister feared it and, I am convinced, had Captain Eyre gone ashore unprotected, serious harm would have come to him.

The day after the collision, a British consular court made up of the consul, two naval officers and two masters of merchant vessels, all British subjects, met to investigate the collision. Mr. Charles E. deLong, our Minister to Japan, and who resided at Yokohama, took charge of our case. He was ably assisted by the navigator of the *Idaho*, Lieutenant, now Captain, T. A. Lyon, retired. All nautical and technical questions were drawn up by Lyon, he did the work, while deLong, a cheerful, breezy lawyer from Nevada, did the talking. The *Bombay's* case was taken care of by Mr. Barnard, the only English speaking lawyer in the city.

After deliberating for ten days upon the 16 charges and specifications the court found . . . . "but we regret to have to record it as our opinion that he acted hastily and ill-advisedly in that, instead of waiting and endeavoring to render assistance to the *Oneida* he, without having reason to believe his vessel was in a perilous position, proceeded on his voyage . . . . we therefore feel called upon to suspend Mr. Eyre's certificate for six months from this date." His steamship company allowed him



THE "ONEIDA" MONUMENT IN THE FOREIGN CEMETERY, YOKOHAMA, JAPAN

full pay during the suspension. Had he run his vessel on a charted rock, and floated her without damage at the next high tide, the same punishment might have been awarded.

I do not wish to criticise the court. No doubt their finding was the outcome of the very conflicting testimony, but two members, masters in British merchant marine, held, and often spoke of it after the court had adjourned, that the *Oneida*, when she saw collision was unavoidable, should have ported instead of starboarding her helm. These men believed in the old sea tradition, more in vogue in those days than at the present time, that a port helm was the correct one in nine cases out of ten.

When Yates saw, several points on the starboard bow and about one-half mile distant, the three lights of the *Bombay* suddenly swing to cross his course with a port helm, he considered the safest course to be to starboard his helm in the hope that both vessels would thereby assume parallel courses.

The general opinion among naval officers of various nations at Yokohama was that had the case been tried by a court composed entirely of naval officers the investigation would have been more thorough and the findings probably different.

At the time of the collision Admiral Rowan in the flagship *Delaware* was at Hong Kong. There was no cable communication between China and Japan in those days, but as soon as he heard the news of the disaster, he sent Commander, the late Rear Admiral, F. A. Roe, U. S. N., his chief of staff, to Yokohama and followed somewhat later with the flagship. Commander Roe convened a naval court of inquiry of which he was the senior member, and Paymaster, now Pay Director, G. A. Lyons, retired, the judge advocate.

This court called only survivors of the *Oneida* before it, and they gave about the same testimony that they had given before the British consular court. No really new points bearing on the case were brought out. The court was anxious to ascertain among other questions why the *Oneida* had left port with only three serviceable boats. Williams was dead but Yates, before the British court, stated "I heard that Captain Williams said 'I have asked for boats and cannot get them.'" This question of a shortage of boats was often discussed by the officers on the *Idaho* before the *Oneida* sailed. It was generally understood that on her arrival at Kobé she was to receive a cutter, a sailing launch and a dinghy, to replace those lost in a typhoon the previous August. It has never been satisfactorily settled who was responsible for this negligence.

The opinion and findings of our naval court of inquiry exonerated the officers of the *Oneida* on all points and blamed the *Bombay* for the collision.

A month after the disaster the only diver on the station arrived from Shanghai. He made two descents, in 110 feet of water, and reported as follows: The vessel was standing upright, and the light being excellent, he could see a distance of 15 feet or more. All of the stern had been cut off to the cabin

skylight, the propeller could not be seen, and all skylights and hatches were so completely filled with wreckage that he was prevented from entering the wardroom. It had been hoped that he could recover the paymaster's safe and other articles. He found no bodies. In his judgement it was impracticable to raise the ship.

If I remember correctly the wreck was never sold but was abandoned by us. Fishermen very soon stripped her of sails and rigging. Many years later, when the Japanese government built fortifications on Saratoga Spit, they blew up the wreck, recovered several guns, anchors and chains, and found a few human bones, which were interred at a temple near Tokyo and a small monument was erected over them.

Our government made no effort to recover damages. The *Bombay* hailed from London and only in the courts of England could proceedings be instituted against her owners, the Peninsular & Oriental Steamship Company. The administration at Washington was not anxious to antagonize England at that time; a joint high commission was being formed in Washington to draw up an agreement known when ratified as the Treaty of Washington, by the terms of which the "Alabama Claims" were submitted to an international Tribunal which sat in Geneva, Switzerland, during 1871-1872.

The question has often been asked, why, when so near to the shore, were not more men saved from the *Oneida* by keeping afloat until picked up or by swimming to the beach. The chief reason was the lack of sufficient boats. The third cutter unfortunately left with only 17 men. The gig had been destroyed in the collision and the only remaining boat was the first cutter. She was so overcrowded, that seven men were lashed with their neckerchiefs to the gunwales, and in this way towed to the shore four miles distant.

Although starlight it was dark, and in those days after sundown the locality was very little frequented by either foreign vessels or native craft. It blew quite fresh from the NE., the sea was choppy and a strong ebb tide was running. The temperature of sea water on board the *Idaho* 12 miles distant was 42° F. at 7 p. m. Warmly dressed as all the *Oneida's* men were on that chilly evening the strongest swimmer could not have reached shore under such circumstances.

For over six weeks a careful search was kept up and a reward offered for bodies. To our surprise and sorrow only the three mentioned were found of the 115 lost. No doubt many bodies were swept out to sea by the strong ebb tide, and many more carried down by suction and buried in the shifting sands.

Strange to say in less than six months three members of the British consular court met violent deaths. Commander Moore, the staff commander of the *Ocean* was drowned in the capsizing of a boat at Woosung, China. Captain Gilfillen died at Yokohama under anæsthesia, given to set a broken collar bone. The captain of the bark *Rockcliff* cleared his vessel for Saigon, Cochin China, the ship and crew were never heard of again. Captain Eyre died within three months after his suspension. After the collision the *Bombay* ran for several years as a mail steamer between Hong Kong and Yokohama. Later she was sold and used as a tea hulk at Nanking. On Christmas evening, 1880, she was accidentally destroyed by fire at Woosung, China.

Names of Officers Lost in the Oneida.—Commander E. P. Williams, commanding; Lieut. Commanders W. F. Stewart and A. W. Muldauer; Masters W. Sargent, J. R. Phelan, J. W. Cowie, and C. E. Brown; Midshipmen W. E. Uhler, J. K. Bower, C. A. Coop, J. C. Hull, J. R. Adams; Paymaster T. L. Tullock; Asst. Surgeon E. Frothingham; First Asst. Engineers N. B. Littig and H. Barstow; Second Asst. Engineers C. W. C. Senter and F. Fornance; Carpenter J. D. Pinner; Pay Clerk W. C. Thomas; in all 20 officers and 95 men.

Officers Saved from the Oneida.—Master I. I. Yates, Surgeon J. Suddards, Boatswain N. Anderson, Captain's Clerk W. W. Crowninshield and 57 men.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

COMPASS CORRECTION BY THE AZIMUTH METHOD, AND A NEW MANNER OF COMPUTING THE FLINDERS BAR CORRECTION

By COMMANDER J. B. PATTON, U. S. Navy

The following method of correcting compasses has been used by the writer during four or five years of sea experience in charge of compasses. It applies to compasses so situated that bearings can be taken with the azimuth circle.

The "azimuth method" of getting a ship on the desired magnetic heading is simpler and more practical than the "lubber's point" method generally used in the navy. Being simpler, it promotes accuracy by enabling the observer to concentrate on the most important point, *which is to get correct azimuth observations.* We all know the delay and confusion caused by trying to make the helmsman keep the vanes of a distant pelorus pointed at the sun.

The most common errors are due to an unsteady compass card. In such cases the mean of several observations should be taken.

I

TO CORRECT *B*, *C*, AND *D*, WITH PERMANENT MAGNETS AND QUADRANTAL SPHERES

1. PREPARATION: Select time and place using method of azimuths of the sun. Select a time when the magnetic bearing of the sun is one or two points from magnetic East or West, otherwise the mast or smoke-pipe may prevent your getting observations on those headings. On this coast, where the variation is westerly, the proper time, in winter, would be in the morning; in the summer, late in the morning, or late in the afternoon. Do not use the pelorus in correcting.

2. Set watch to local apparent time. Get from chart or tide book, or by observation on shore, the variation of the compass. From the sun's azimuth tables obtain the sun's true azimuth at intervals during the hour selected. Apply the variation and

obtain the corresponding magnetic azimuths. Then, on cross-section paper, plot a curve of times and magnetic azimuths. Reference to this curve will show the sun's magnetic azimuth at any moment. A table showing the magnetic azimuth for each ten minutes will do as well as the curve.

The variation from chart may be 1° or 2° in error. *This will not affect the compass correction,* but to obtain the correct residual deviations, the variation should be known more exactly.

3. See that all preparations are made and assistants properly instructed, so that you will have nothing to delay you when the time comes to correct. See that the mechanism of the binnacle is in good order, moving parts working freely and not blocked with paint. Put a little oil under the azimuth circle, and see that the latter fits snugly on the bowl. See that awnings, etc., are clear, and that iron masses near compass are in their usual sea condition, and ship is on an even keel.

4. Place heeling corrector at bottom of tube, and North (red) end up in North latitude. If you have any previous information as to its proper location, place it accordingly. It is best to set it by means of the heeling adjuster, see paragraph 25.

5. Place quadrantal correctors at middle of slot. If you have any previous information as to their proper location, place them accordingly.

6. Give watch and curve to an assistant and tell him to keep you informed continually, without your having to ask him, as to the magnetic azimuth of the sun as shown by curve.

7. Station a quartermaster at the compass being corrected and tell him to conn the helmsman.

II

8. To CORRECT *C:* Tell quartermaster to head North (or South) by the compass being corrected. (All courses refer to the compass being corrected.) When the ship is within about 5° of North note the sun's azimuth by compass roughly, apply magnetic azimuth mentally, and obtain rough deviation. With athwartship tray near bottom of binnacle, put in athwartship magnets to reduce deviation, remembering that the blue end of magnet will attract the North point of compass. One magnet for each five degrees' deviation will be an approximation.

Caution the quartermaster to keep the ship headed North (the magnets, of course, will have moved the compass off the North

heading). When again headed about North note the deviation roughly and by adding more magnets, or by moving the tray, reduce it to nearly zero.

Now take very careful observations and by moving the tray reduce the deviation to zero. Do not delay until the quartermaster gets exactly on North, and do not allow him to bother you by saying "on," or "not quite on," etc.

The value of this method is that you do not look at the lubber's point until you have removed all the deviation, and then you note the heading, and if the ship is heading about North (say N. 2° E.), you can safely say there is no deviation on North. Of course, a moment later, you can check it when you come on North exactly.

9. Tell quartermaster to head South (or North). After being on that heading about ten minutes, *note the deviation very carefully* (say it is +4°). *Move athwartship magnets so as to reduce it one-half* (to +2°). Check this very carefully. (If you should head North again, a deviation of +2° should appear.) Look out for lost motion in the magnet trays.

This constant deviation is the sum of the error in variation used, plus *A*, plus *E*. *A* includes instrumental errors in the azimuth circle. (Lubber's point errors are not involved when correcting by this method.)

III

10. To CORRECT *B*: Now head East (or West) and proceed as at North, putting in fore-and-aft magnets to *reduce the deviation to zero. (If you cannot get bearings of sun on both East and West on account of smoke-pipe being in the way, assume E to be zero and adjust on one of these headings, leaving an apparent deviation (+2°) as on South.)*

11. Then head West (or East) and *note deviation carefully.* (If *E* is very small you should get +4° as at South.) *Move fore-and-aft magnets so as to reduce it one-half* (say +2°). This residual is due to error in variation, plus *A*, minus *E*.

IV

12. To CORRECT *D*: Now head NE. (or NW., SE. or SW.) and move spheres so as to *reduce deviation to zero.* It is best to use quadrantal correctors large enough to correct from the middle or outer end of slot. It is better to over-correct than under-correct. (See discussion below under "Interference of Correctors.")

13. Then change course eight points (say to NW.) and *note deviation carefully.* (If E is small, you should get $+4°$ as before.) *Reduce it one-half by moving the spheres* (say to $+2°$). (If you headed back to NE. you should get a residual of $+2°$.) *(It is usually sufficient to correct on only one intercardinal point and leave a residual equal to the mean residual on North, East, South and West.)*

This residual deviation is due to error in variation, plus A. The residual deviation on NE. and NW. mathematically, is a mean of those on N., S., E. and W. The compass is now corrected for B, C, and D, *in spite of the fact that the variation used may have been in error.* The apparent residuals on North and South should be equal, those East and West equal, and those on all intercardinal points equal, when the correctors are properly set. *If you had to move the spheres materially, then recorrect on N. and S.*

V

RESIDUALS

14. You have now recorded the apparent residual deviations on South, West, and Northwest. Put the ship on the other five cardinal and intercardinal points and note and record the apparent residual deviations carefully. *Remember that it is important to get a correct azimuth of the sun, but not important to have the ship headed on precisely the desired point at that time.*

Of course, the ship must be accurately headed if you are noting the deviations of other compasses by comparison.

15. TABLE OF RESIDUAL DEVIATIONS: (a) If the variation used was obtained by accurate observation on shore, then the apparent residuals obtained in paragraph 14 are the correct deviations, and are due to the effect of A and E, where A includes constant errors in the azimuth circle.

(b) If there is any doubt about the accuracy of the variation, then assume A to be zero, and all the apparent residuals must be corrected by a constant quantity. To do this, *add algebraically to each deviation a quantity that will make the deviation curve symmetrical with regard to the North and South line.*. (In this case $-2°$.) In other words, subtract the *mean* residual from each residual.

16. THE COEFFICIENT A: If the coefficient A is deduced from a set of deviations it will contain any error made in the variation

assumed when swinging ship. If no variation is assumed, but the ship is swung by the method of steaming on a magnetic range, the error of that magnetic range will be included. If swung by the method of reciprocal bearings, the results will be too inexact to be of value. I doubt if in recent times any ship has been swung by such a method. With a well located compass the value of *A* is much less than the probable variation error when the latter is taken from the chart.

17. Therefore, *if you use variation from chart (unchecked) in correcting and swinging for residuals, consider A zero, and correct residuals as described in paragraph 15(b).* But if you have a reliable coast survey record of the local variation, or if you have checked the chart by setting up a compass on shore and taking an azimuth of the sun for variation, then accept the results as described in paragraph 14 for your residual deviation table.

VI

COMPASSES WITH LARGE DEVIATIONS

18. If you start with a compass with large deviations, say over 10°, proceed as follows to make an approximate correction before proceeding with final correction. Head on any cardinal point and correct approximately to less than 5°. Change course eight points and correct again. Then change to an intercardinal point and correct with the quadrantal spheres approximately. (See paragraphs 8, 10 and 12). If deviation on East or West is over 45° the directive force on North or South may be reversed. Therefore correct on East or West first.

VII

CORRECTION ALONGSIDE DOCK

APPROXIMATE CORRECTION OF COMPASS OF NEW SHIP OR OF COMPASS THAT HAS BEEN CHANGED IN POSITION ON A SHIP

19. Prepare binnacle and correctors as mentioned before, pars. 3, 4 and 5.

20. Note on chart some well-defined distant object (d. o.) a mile or more away, and note carefully its magnetic bearing from the ship's dock, using parallel rulers. Note from the chart the line of bearing of the face of the dock. This gives you the ship's heading (magnetic)—say it is about WNW. Note roughly the

general direction of North (magnetic) and West (magnetic) and NW. (magnetic).

21. At the proper stage of tide you can slack lines and can point the ship about West. With azimuth circle, note bearing of distant object (d. o.) by compass, and apply the magnetic bearing mentally and obtain roughly the deviation. Put in fore-and-aft magnets to reduce it. Repeat the operation until deviation is zero and ship's head is about West *by compass.* (See pars. 8 and 10.)

22. At slack water get a tug to pull the bow or stern out till ship's head points about North (magnetic). Observe azimuth of distant object (d. o.) and compare it mentally with the magnetic bearing taken from chart and obtain deviation. Put in athwartship magnets, and proceed to reduce it to zero, keeping the ship's head about North *by compass.* (See par. 8.)

23. By use of lines or tugs now head NW., note deviation and correct with the quadrantal correctors until it is zero and ship heads about NW. *by compass.* The above method was used on a ship having deviations up to 60° and the residual deviation was less than 3°. Total time of operation about two hours.

VIII

REMARKS

The residuals obtained while compensating are usually more exact than those taken by a hurried swinging ship afterwards.

The compass cannot be trusted to remain correct and must be checked by daily azimuths.

When deviations appear it is often better to readjust than to swing ship.

The first adjustment should be on North and South, as there is less interference by smoke-stack, etc., than on East and West.

The use of the pelorus or many assistants is not recommended.

Observations of the sun by the mirror on the azimuth circle are much more accurate than observation of terrestrial objects by the azimuth circle vanes. Bear in mind the effect of hot smoke-pipes and stray electric currents.

Do not use a *single* quadrantal sphere as it is subject to induction from the heeling magnet and horizontal magnets causing semicircular deviation.

In correcting take plenty of time, say ten minutes on each heading, in order to let the induced magnetism establish itself.

IX

CORRECTION OF THE HEELING ERROR

The heeling error is greatest on North and South, and is zero on East and West courses.

It is usually greatest in high North latitudes, and usually draws the North point of needle to windward (that is, "uphill"). It decreases gradually to zero at some place south of the equator. Farther south it changes sign and draws the North point of needle to leeward.

The quadrantal deviation being corrected, the heeling error is caused by the vertical subpermanent magnetism represented by R and an induced force kZ, which varies with Z. These usually act together north of the magnetic equator, and opposed south of the equator. At some point not far south of the equator they neutralize each other, and farther south the effect of kZ predominates. The error is therefore greater in North latitude than South latitude.

It is corrected by a vertical magnet under the compass, red end up in the North latitude, and blue end up in the far South latitude. Its position must be changed for different latitudes and it disturbs the Flinders correction, so that after shipping it or moving it the deviation on East and West should be recorrected.

24. To CORRECT HEELING ERROR: When the ship is on a northerly or southerly course and rolling, and during the rolls the North point of needle is observed to go to windward, the heeling magnet is raised in the tube to correct it, care being taken not to overcorrect. (Use it sparingly, as it interferes with other correctors.)

Then head East and West and correct with the fore-and-aft magnets any deviation that may have been caused by the heeling magnet inducing magnetism in the Flinders bar.

25. The general effect of the heeling magnet is to neutralize the vertical subpermanent force R, and the variable vertical force kZ, that is, the remaining vertical force should be the same at the binnacle as it is on shore.

This may be done by means of the heeling adjuster, as described in the text-books. Balance the heeling adjuster on shore, then set it up on the binnacle, and move the heeling magnet until the vertical force is the same as on shore, the quadrantal deviation having been first completely corrected.

If the heeling error is corrected in *an average North latitude*,

it should be fairly satisfactory for all usual latitudes without moving the magnet.

The above rules are satisfactory and convenient for practical use. The method of using the heeling adjuster to make the vertical force at the compass the same as the vertical force on shore, is used by professional compass adjusters in New York.

For those who wish to be more exact, it may be stated that there is a third cause of heeling error. When the ship is headed North or South, and heeled over, the upper edge of the deck and upper end of deck beams have blue magnetism induced in them by the earth's vertical force, which tends to draw the North point of compass to windward. It happens that this force is corrected partially (or possibly entirely) by the quadrantal spheres.

The text-book method of correcting exactly, is to balance the heeling adjuster needle on shore. Then calling the distance of the balance weight a, the heeling adjuster is placed on the binnacle, and the weight is shifted to a new distance $a \times \lambda$, and the heeling magnet is raised until the needle balances (the quadrantal deviation having been corrected). The value of λ used should be deduced from data obtained after the spheres are in place and after the Flinders bar is shipped. It is apparent that the Flinders bar, by induction from the compass needles, and the earth's horizontal force, when the ship is headed North, will increase the directive force of the compass.

To be correct for all latitudes, that part of the heeling error due to induction in the vertical iron k should be corrected by a vertical rod of soft iron through the center of the compass. This is mechanically impossible, but the Flinders bar may be used to help matters as follows:

Raise the bar until the top is several inches above the level of compass. Then when headed North and the ship heels, the top, or blue end will go to leeward and tend to keep the North point of compass from going to windward, or South point from going to leeward.

A disadvantage would be that it would set up a small heeling error on East and West.

X

TO CORRECT THE SEMI-CIRCULAR DEVIATION ON EAST AND WEST BY MEANS OF PERMANENT FORE-AND-AFT MAGNETS AND THE FLINDERS BAR

26. With the ship on the *magnetic* equator, correct on East and West with permanent fore-and-aft magnets.

27. Then leave the equator and any deviation that may appear on those headings, correct with a Flinders bar (heeling magnet out). Then put in the heeling magnet if required, and recorrect with fore-and-aft magnets any deviation on East or West that was caused by the introduction of the heeling magnet. Then correct any quadrantal deviation caused by the Flinders bar. (See pars. 44 and 45.)

28. TO COMPUTE THE CORRECTION FOR *P*: As ships may not often go to the magnetic equator, the equatorial correction can be computed as follows, from simple observations taken in two latitudes, say New York and Vera Cruz:

Obtain from chart portfolio No. 1 the vertical force (Z) chart No. 111, B. A. 3613. (If not available, get horizontal force and magnetic dip charts and compute Z.) ($Z = H \tan \theta$.)

At the high latitude:

Let Z_1 = vertical force (chart).

d_1 = distance in inches of fore-and-aft magnets from compass needles after correcting on East and West.

At the low latitude:

Z_2 = vertical force (chart).

d_2 = distance of fore-and-aft magnets after recorrecting on East and West.

Let d_3 equal the distance the fore-and-aft magnets would have to be placed if ship were on the equator.

29. The formula is based on the law that the correcting effect of the magnet is proportional, inversely, to the cube of its distance from the needles. The *distance* being the *diagonal distance* from the end of the magnet to the end of the needles. The vertical scale on the central column of the binnacle gives the vertical distance, and this distance must be translated into the correct diagonal distance, and the computed d_3 must be translated back into the vertical scale distance. This law was tested on the navy binnacle and found very exact.

The half length of the magnet is two inches and the half length of the needles is three inches, so that the corrected diagonal distance is $=\sqrt{d^2+4+9}=\sqrt{d^2+13}$.

The following table may be used in correcting d:

Vertical scale distance	Correct diagonal distance	Vertical scale distance	Correct diagonal distance
7″	7.87	13″	13.49
8″	8.77	14″	14.46
9″	9.70	15″	15.43
10″	10.63	16″	16.40
11″	11.57	17″	17.38
12″	12.53	18″	18.36

The vertical scale distance may be used directly in the formula and give good results if the latitudes are separated over 20°.

30. CASE I. U. S. S. ALPHA: Corrected compass on East and West in New York and Vera Cruz, and recorded $d_1=9$ inches, and $d_2=10$ inches.

New York $Z_1=.55$ $d_1=9''$ d_1 (corrected) $=9.7''$
Vera Cruz $Z_2=.35$ $d_2=10''$ d_2 (corrected) $=10.63''$

Substitute in formula (1)

$$d_3^3=\frac{(Z_1-Z_2)d_1^3 d_2^3}{d_1^3 Z_1-d_2^3 Z_2}. \qquad (1)$$

$$d_3^3=\frac{(.55-.35)913\times 1202}{913\times .55-1202\times .35}=2691.$$

d_3 (corrected) $=\sqrt[3]{2691}=13.9$.
d_3 (vertical scale) $=13.9-.48=13.42$.

Now set fore-and-aft magnet tray at 13.42 inches (the computed equatorial distance) and correct the remaining deviation on East and West with the Flinders bar (heeling magnet being out). Then put in heeling magnet, and recorrect on East and West with fore-and-aft magnets any deviation caused by induction of heeling magnet in the Flinders bar. Then correct with the spheres any quadrantal deviation caused by the Flinders bar. If the spheres were moved materially, recorrect on North and South. (See pars. 44 and 45.)

31. CASE II. U. S. S. BETA: If, when you substitute in formula (1), the denominator yields a *negative quantity* your computed value of d_3 will be *negative*. *This means that the fore-and-aft*

magnet must be reversed end for end. Then set the tray at the computed distance, and proceed as in Case I.

32. CASE III. U. S. S. BETA: If, when correcting in the second latitude, the fore-and-aft magnet must be reversed end for end to what it was in the first latitude, proceed as in Case I, except the formula is changed slightly; that is, both terms in the denominator are positive and must be added. Compute d_3 and set the tray at d_3 *with the poles of the fore-and-aft magnets in the same direction as at the low latitude.* Then proceed as in Case I.

Z is always taken as positive, unless second latitude is across the magnetic equator; in that case call Z_2 negative.

33. If the two latitudes are not far separated, the Flinders correction may be only an approximation. In that case consider the bar a permanent part of the ship, and on the next voyage obtain new values for d_1, d_2 *and* d_3, care being taken to have the heeling magnet in the same place for each set of observations.

34. The binnacle scale for d extends from 7 inches to 18 inches. If, after final adjustment, the fore-and-aft tray is too close to the needles (say less than 10 inches) then add more magnets and recorrect with the tray lower down. If the value obtained for d_3 is greater than 18 inches, remove half the magnets and set tray at $d_3 \times \sqrt[3]{1/2}$, or remove two-thirds of the magnets and set tray at $d_3 \times \sqrt[3]{1/3}$.

This rule will not be exact, unless all the magnets have the same strength, which is unusual.

There is usually lost motion in the screw of the tray, and in its final position it should be forced down by hand.

The magnets should be grouped symmetrically about the scale index pointer on the tray.

XI

THE FLINDERS BAR CORRECTION

35. The Flinders bar should be fitted on the compass to prevent the large change in the semi-circular deviation (principally on East and West) due to a change in magnetic latitude.

In practice we cannot realize the full theoretical value of the Flinders bar, and prevent all change, but the change can be reduced to one or two degrees, which is a great convenience.

There is an unaccountable prejudice against this corrector. It reminds one that not very long ago there was a prejudice against

"doctoring" a compass with magnets of any kind, preferring to let the compass have its "natural deviation."

The fore-and-aft force producing semi-circular deviation is in absolute units: $\lambda HB' = P + cZ$. (a)

P represents the force due to subpermanent magnetism, and when corrected by a permanent fore-and-aft magnet, is permanently neutralized for all latitudes.

cZ represents that part due to induction in vertical iron (for instance, a smoke-pipe) by the vertical component (Z) of the earth's magnetism.

Z is zero at the magnetic equator and increases to .6 near the magnetic poles.

On crossing the magnetic equator Z changes sign and causes the second term (cZ) in equation (a) to become subtractive. In other words, the smoke-pipe had blue magnetism induced at the top while in North latitude, and has red magnetism at the top in South latitude. If cZ acts with P on one hemisphere, it will be opposed in the other hemisphere.

The problem is to ascertain the magnitude and sign of these two parts of the fore-and-aft force, and to correct the force P with a fore-and-aft permanent magnet, and to correct the force cZ with a vertical rod of iron (Flinders bar) placed on the opposite side of the compass form the disturbing vertical iron (c).

The rod will have magnetism induced in it, which will vary as Z, and if of proper size will neutralize the variable force cZ in all latitudes.

36. The same reasoning will apply to the force $\lambda HC' = Q + fZ$ acting in an athwartship line. An athwartship Flinders bar may be fitted, or the bar may be placed in the resultant angle of cZ and fZ. But this is not recommended, as the athwartship force is fairly constant and the Flinders bar is best on the center line.

37. On the *Culgoa* the following results were obtained (Flinders bar unshipped). (Record being incomplete, table is partly computed.)

	Z	Uncorrected Deviation on East	Distance of F and A Magnets to Correct
New York	+.55	—29°	8.3" blue end fwd.
Equator (magnetic)	0.	—10°	11.4" " " "
Magellan St	—.325	—2°	18" " " "
Melbourne	—.57	+4°	17" red " "

This shows that P and cZ were acting together in North latitude, and opposed in South latitude. At Magellan Straits they were opposed and almost neutralizing each other. At Melbourne cZ predominated, causing easterly deviation.

Some ships have these forces opposed in the northern latitude, and if no Flinders bar is used, will have to reverse the direction of the fore-and-aft magnets on arriving at a high North latitude.

On the *Culgoa*, the fore-and-aft magnets were set at 11.4", blue end forward, and the remainder of the deviation corrected with a Flinders bar. The change in deviation on East when going from South to North latitude was less than 3°.

38. The following is quoted from the valuable compass reports made by Commander W. C. Cole, U. S. N., navigator of the *Kansas*, in 1908:

> This compass (standard) shows normal conditions, and the compensation has been made practically universal. The change in the residual deviation between Punta Arenas and Magdalena Bay (before target practice) being so small that the error on any point did not exceed 1°. Athwartship, as well as fore-and-aft, Flinders bars were used in this compensation, though the former was small size.
>
> It is believed that when the Flinders bar is of suitable material, there is small chance of magnetism of any great strength. The advantages derived from a well-placed Flinders bar are so important that they greatly overbalance the possibility of magnetization of the bar.

39. The relation of these forces is shown by the following formulæ:

At a high latitude (L_1), correct on East with fore-and-aft magnets and note distance in inches of magnets from compass needles (d_1).

Recorrect at a low latitude (L_2) and note distance of magnets from needles (d_2).

At L_1 let Z_1 = vertical force (chart).
d_1 = distance of magnets (observed).
At L_2 let Z_2 = vertical force (chart).
d_2 = distance of magnets (observed).
Let d_3 = distance of magnets to correct if ship were at equator (compute).

The formulæ are easily deduced from the fundamental formula $\lambda HB' = P + cZ$, and the law that the correcting effect of the magnet is inversely proportional to the cube of its distance from the needles.

40. CASES I AND II:

$$\frac{P}{P+cZ_2}=\frac{d_2^3}{d_3^3} \qquad \frac{P}{P+cZ_1}=\frac{d_1^3}{d_3^3};$$

hence,

$$d_3^3=\frac{(Z_1-Z_2)d_1^3 d_2^3}{d_1^3 Z_1-d_2^3 Z_2}. \tag{1}$$

41. CASE III: P and cZ opposed, and in one latitude, $cZ>P$.

$$\frac{P}{P-cZ_2}=\frac{d_2^3}{d_3^3} \qquad \frac{P}{cZ_1-P}=\frac{d_1^3}{d_3^3};$$

hence,

$$d_3^3=\frac{(Z_1-Z_2)d_1^3 d_2^3}{d_1^3 Z_1+d_2^3 Z_2}. \tag{2}$$

42. To obtain the magnetic latitude where $P=-cZ$ and deviation is zero:

$$Z_0=\frac{d^3 Z}{d^3-d_3^3}. \tag{3}$$

THESE FORCES CAN BE SHOWN GRAPHICALLY (see sketch):

Let EE represent magnetic equator.

Let MM represent magnetic meridian.

Graduate MM from O at equator to .6 near poles to represent the earth's vertical magnetic force, or magnetic latitude (Z).

Graduate OA to some convenient scale to represent, in inches, the distance of fore-and-aft magnets from needles (d).

In two latitudes, observe d_1 and d_2 and compute d_3.

Using the corresponding value of Z (chart), plot the points d_1, d_2 and d_3.

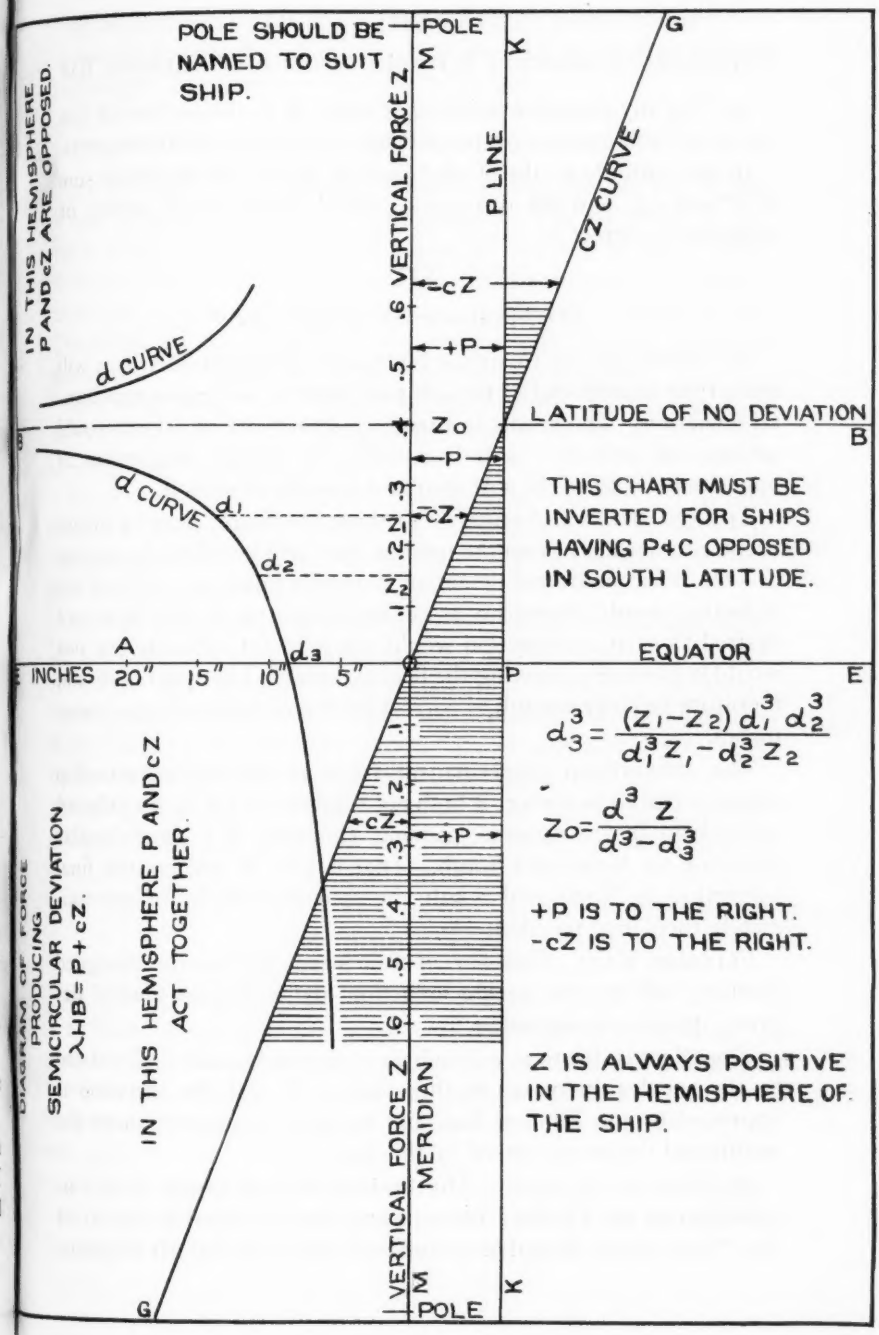
Compute from formula (3) the value of Z_0 for no deviation, and draw line BB.

Draw curve through d_1, d_2 and d_3, and tangent to BB and MM.

Other points on the curve may be computed by the formulæ.

The curve should be repeated symmetrically on the other side of line BB.

DIAGRAM OF FORCES: Draw OG at some convenient angle with meridian (about 30°). Where it intersects BB, draw line KK parallel to meridian. Then OP will represent the force P in all latitudes, and the abcissæ of OG will represent cZ.


POLE SHOULD BE NAMED TO SUIT SHIP.
POLE
IN THIS HEMISPHERE P AND cZ ARE OPPOSED.
d CURVE
VERTICAL FORCE Z
P LINE
cZ CURVE
=cZ
+P
Zo
LATITUDE OF NO DEVIATION
THIS CHART MUST BE INVERTED FOR SHIPS HAVING P&C OPPOSED IN SOUTH LATITUDE.
d1
d2
d3
INCHES 20" 15" 10" 5"
EQUATOR
$d_3^3 = \frac{(Z_1 - Z_2)\, d_1^3\, d_2^3}{d_1^3 Z_1 - d_2^3 Z_2}$
$Z_o = \frac{d^3 Z}{d^3 - d_3^3}$
+P IS TO THE RIGHT.
-cZ IS TO THE RIGHT.
Z IS ALWAYS POSITIVE IN THE HEMISPHERE OF THE SHIP.
DIAGRAM OF FORCE PRODUCING SEMICIRCULAR DEVIATION λHB'=P+cZ.
IN THIS HEMISPHERE P AND cZ ACT TOGETHER.
VERTICAL FORCE Z
MERIDIAN
POLE

XII

CONTINUOUS CORRECTION WITHOUT THE USE OF FLINDERS BAR

43. For any magnetic latitude, or value of Z, the abcissæ of this curve (d) will give the proper setting of the fore-and-aft magnets.

In any latitude Z, the shaded portion shows the algebraic sum of P and cZ, and the distance to the d curve shows setting of magnets to correct it.

XIII

INTERFERENCE OF CORRECTORS

44. INDUCTION OF COMPASS NEEDLES: Adjacent soft iron will attract the nearest end of the compass needles, and cause quadrantal deviation. The needle is a magnet, either end of which would attract and pick up a soft iron slug. It induces magnetism of opposite polarity in the soft iron and thereby attracts it.

THE QUADRANTAL SPHERES: If these are nearer than 13 inches (center to needles) from the needles, they will be affected, causing a $-D$. The quadrantal deviation is usually due to a $+D$, and the induction would therefore assist in correcting it, but it is not desired as such a correction would not hold for all latitudes, nor would it assist in correcting the heeling error. The spheres should therefore be large enough to correct from a distance of 13 or more inches.

The athwartship subpermanent force Q and the athwartship magnets placed to correct it both act together to set up an induced magnetism in the spheres, causing (possibly 5°) semi-circular deviation on North and South. That is why in making the final correction on North and South, the spheres must be in approximately their final position.

FLINDERS BAR: This bar, if full sized, and in the designed position, will receive needle induction and will give several degrees' quadrantal deviation.

The effect is due to a $+D$, which is opposed to the $-D$, caused by the needles' induction in the spheres, so that the situation is improved by the Flinders bar, and we need not worry about the quadrantal deviation caused by this bar.

45. HEELING MAGNET: The heeling magnet causes a serious induction in the Flinders bar, causing semi-circular deviation of the P type, which should be corrected by the fore-and-aft magnets.

If the position of the heeling magnet were never changed, this would not be objectionable. If the position of the heeling magnet is changed, then recorrect on East and West.

XIV

46. REMARKS: The popular objection to a Flinders bar is that it may become permanently magnetized. The objection is not valid, except with the light Mark I rods. As long as they stay in their case they are not apt to have any sudden change. It is almost impossible to hammer any magnetism in the heavy Mark II bar. The Mark I rods will pick up magnetism if held in the meridian and struck. They can be tested as follows for polarity:

The ship being on a steady heading, stand the rod on deck vertically with the top end near the East point of compass and note bearing of distant object.

Reverse the rod end for end, and again note bearing of distant object. The end that attracted the North end of needle most has blue magnetism in it. It can be taken out by pointing that end North and rapping it a little.

47. The writer has noted, but has not verified, that on approaching the equator the induced magnetism in the Flinders bar would appear to leave promptly, while that in the smoke-pipe would leave tardily. If this is true, it would argue that the Flinders bar should be made of the same material as the smoke-pipe. All bars should be machined as the surface scale is magnetic.

During the cruise of the fleet around the world, many of the navigators fitted Flinders bars and made most favorable reports about them.

XV

SUMMARY

48. The following is recommended for a new ship:

1. Make approximate correction of *B*, *C* and *D* at the dock.

2. It is best to use spheres large enough to correct at a distance of 13 inches or more. Procure a Flinders bar, Mark II. If convenient, set heeling magnet by means of heeling adjuster. (See par. 25.)

3. When underway, make careful correction of *B*, *C* and *D* (without Flinders bar), and make record of (*d*) the distance of fore-and-aft magnets from needles. (See pars. 10 and 11.)

(If the deviation on East is very large, say over 30°, you may assume that P and cZ have the same sign, and correct all but 10° or 15° with the Flinders bar, as an approximation.)

4. Place heeling magnet if it has not been done, and if ship is rolling. (See par. 24.)

5. On change of latitude, recorrect on East and West with fore-and-aft magnets, and obtain (d) the distance of fore-and-aft magnets from needles. After the first target practice, d_1 and d_2 should be obtained again. (See pars. 10, 11 and 33.)

6. (a) Compute d_3.

(b) Take out heeling magnet.

(c) Set fore-and-aft magnet tray at d_3.

(d) Ship Flinders bar (or change the bar as required if already shipped), and correct remaining deviation on East and West.

(e) Replace heeling magnet.

(f) Recorrect on East and West with fore-and-aft magnets.

(g) Recorrect the quadrantal deviation.

(h) Recorrect on North and South.

In making all corrections, follow the methods described in pars. 1 to 13.

The writer desires to acknowledge the courtesy and assistance of Lieut. Commander C. T. Owens, U. S. N., in charge of the Compass Office.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ENGINEERING STANDARDS AFLOAT

By Lieut. Commander H. C. Dinger, U. S. Navy

To properly carry on the work of the engineer department of a naval vessel there must be provided a capable personnel efficiently organized. Aside from organization and more important than its system and methods are the *ideals* or *standards* that are set for accomplishment and which guide the action, work and thought of the personnel. If the proper ideal or standard is set before the personnel and an incentive provided, the efforts of the personnel can at once be intelligently employed and methods of accomplishment will be very quickly developed.

It is thought that a discussion of what the proper and suitable standards of accomplishment should be on the part of the engineer department of a naval vessel might be of interest, and the following discussion of such standards for a naval engineer department is submitted.

The final standard is the proper accomplishment of its allotted contribution to the military end in view.

The navy standards of accomplishment differ widely, and justly so, from those of the engineer department of a commercial vessel. The full accomplishment and final aim on a commercial vessel is fulfilled from day to day, from voyage to voyage, but on a naval vessel the peace time steaming is but a matter of preparation and test. In naval engineering the actual efficiency is not effectively tested nor determined till tried in the stress of war and its preliminaries. Hence the standards of efficiency and sufficiency of the latter must be more or less indirect and will be obtained by various performances that serve to indicate the condition of the engineer department for carrying out its share of the war preparation of the fleet.

In considering the standards of the engineer department on board a naval vessel, the various subjects of importance may be grouped under several heads and among them may be mentioned:

Organization and administration,
Development of training of personnel,
Condition of material,
General as well as steaming economy,
Performance and operation,
Maintenance and self support,
Improvements and modifications,
Determination of engineering data and its corelated information,
Preparation for battle casualties.

ORGANIZATION

Organization is designed for the purpose of efficiently controlling the various activities of men and machines and for accomplishing work in a uniform as well as in the most satisfactory manner. It divides work to be done among the different officers, petty officers and men in an equitable manner. Its object is best accomplished

(a) By having each person in the position where he can do his best work;

(b) In having each part of the work performed by those who are best qualified to perform it;

(c) In having an adequate force provided for any part of the work;

(d) In making as nearly as possible an equal distribution of labor.

These purposes may not always be secured harmoniously. It may be that there is an over-abundance of men who can do one part of the work while there is a deficiency in another. In such cases a proper balance must be struck, the decision being made according to their relative importance. An organization cannot be devised to cover every possible contingency but it is essential that it be sufficiently elastic and flexible to bend and mould itself to the varying needs and demands. In actual warfare these demands are likely to be anything but uniform.

One thing that the organization must do is to distribute the personnel so that every one has a definite task to perform and a

definite responsibility, and that he is fully responsible to someone for the performance of his work and intelligently understands what he has to do. It should require that every person therein will be called to account for failure to accomplish an allotted task and that proper rewards and promotion will be given for excellence in performance.

A comprehensive study of the results sought is a necessary preliminary for the basis of the organization, and the primary consideration should be the military demands upon the engineering department, for they must first be satisfied. Then the organization will have to be planned for the complete accomplishment of all other demands, all the engineering necessities and other incidental requirements.

The organization should be perfected during the time of preparation and should produce well considered, systematic, and definite ways of doing things, which should be so elastic as to be capable of being improved and modified as later experience may demonstrate. This is essential so that when called upon to do anything, orderly routine may never give way to disorder, and that simplicity and uniformity may not be displaced by complexity and variety.

Above all it is important that the organization should first properly provide for those performances, requirements and casualties that are likely in war, and not rest content by preparing merely for the work and activities that ordinarily prevail during peace.

There is always danger of the organization of the engineer department of a man-of-war being too much commercialized. It is not a commercial plant; instead it is an engine of war and its efficient condition and its proper operation for war conditions are the results to achieve by its skilful operatives.

Lack of proper organization is a serious military defect at the same time causing great waste.

It is imperative that uniformity in the general principles of organization be secured in all vessels, although the same details of various parts of the different organizations cannot exactly be applied to vessels which are not similarly arranged or constructed. Uniform general principles can and should be determined and carried out, for too much variety in the matter of organization is bad and particularly so in its effect upon the personnel. When the best way of doing anything on board ship is once determined and developed, such a practice should become universal.

An efficient system for securing a proper record of data and all kinds of useful information is an essential part of the organization, because accurate records are most necessary for comparison of the work which is so largely one of test and preparation.

TRAINING AND INSTRUCTION OF PERSONNEL

One of the chief aims of our engineering work in the fleet should be the improvement and better development of the engineering personnel, for its production and its improvement are matters of lasting benefit as well as an additional assurance of our naval power. The training of the personnel is a special part of the work of preparation and is relatively as important in the engineer department as elsewhere, for these men may be used long after our present vessels have been placed out of service. Training and instruction of personnel should not be considered merely as an attendant circumstance to our engineering work and exercises during the ordinary "day's work," but should be made a *cardinal point* upon which a large part of our energy ought to be expended, for upon the capacity of the personnel will depend engineering efficiency. There should be a constant aim and effort to develop and improve the personnel, for although the training and instruction given the coal passer may not materialize immediately, it will surely be manifested in the petty officers of the future, and in the navy we must always be working for the future.

By good and sufficient methods, well carried out, the new recruit may be taught, trained and made much more valuable to the service than by simply leaving him to roam about without direction, picking up his information here and there by chance. If good instruction is not given he may learn very little because he is not told how and why, and he is not caused to see the great personal and professional advantage of knowledge.

In developing and improving the personnel afloat the following ideas may be mentioned as important. Promotion should invariably depend on ability and a possession of sufficient knowledge to fill that rating; the man must be fully qualified mentally and physically, as well as by manual skill for the higher position. Quarterly marks should be made out only as a result of systematic examinations; and special care should be taken that they are not

given in a careless or perfunctory way, but represent, as closely as possible, a true measure of the man's knowledge and worth. This result can be obtained successfully by averaging the marks or opinions of the several officers and petty officers under whom the man serves, together with the marks obtained as the result of a practical oral examination. The latter is of particular value in showing the man what he does not know, and in giving him a reason for finding out things that it is to his advantage to know.

System of Instruction.—A regular method of progressive instruction should be established and men of each rate should be given a definite course dealing with matters pertaining to the duties of their rate as well as the next higher one. Various petty officers, in addition to the officers, could give short talks to the men on different subjects, and as work goes along, inform the lesser advanced why things are done in one way and not another. These talks or lectures should not be too long; should be designed to retain the interest of the men and, above all, should be thoroughly practical.

Junior and warrant officers of the engineer's department could be utilized for instruction in general service matters, ship and navy regulations, care of clothing and persons, conduct and deportment toward officers, petty officers and other men of the ship, explanation of privilege, punishments, rewards and promotion. Much of this matter can be simply and concisely written up and posted, and then from time to time these notices can be explained, especially to the newcomers. The mere posting of notices does not suffice, the actual attention of the men must be called to the matters.

Opportunities for taking men through ship yards or plants where naval material is being manufactured should be availed of, not merely for the information that can be obtained but on account of the interest and thirst for knowledge that may be excited by such excursions. The practice of visiting and looking over the arrangements and installations on other vessels should also be encouraged.

Other facilities for imparting instruction to the men are:

The presence of proper detailed rules and instructions for operating, cleaning and repairing different machines and apparatus.

Detailed explanations of the causes and effects of different casualties, and how they may be remedied.

Making books, pamphlets, and other engineering literature of elementary character and in simple language available to the men under conditions that will cause them to interest themselves in the subject.

All these are done to a greater or lesser degree on various individual ships but in many things uniform instructions applying to any class of vessels could be prepared. Great improvement in all directions could be made by having more of this matter prepared officially and in shape for serving out to the men. Aside from instruction, there should be a definite system of assignment to duty in order to secure the best development of the different members of the engineer's force. In the lower ratings they should not be kept continually on the same station; but should have systematic service on several stations so as to train the less experienced for a wider field of activity and to determine their special aptitude for any one of several ratings. This shifting should follow a progressive plan and be governed by the experience considered necessary for training for the different ratings. A man should not be shifted about continually but only in so far as to secure the required experience to determine the position that he will best fill, and to give him a training for a higher position.

The development of petty officers as leaders of groups should be taken in hand carefully, and this should be differentiated from mechanical skill. The requirements as to deportment, reliability and thorough attention to duty and constant attention to the best interests of the ship and the service should be thoroughly explained and then exacted. Special efforts should be made to train petty officers in the control of men, in willingness to assume responsibility with *knowledge*, and for taking prompt action in the time of emergency.

The proper development of the engineering personnel is a worthy field of work, and a matter that can be greatly assisted by systematic application of proper methods.

CONDITION

The efficient condition of the engineering material is absolutely essential, and in the ultimate is one of the principal objects of naval engineering in preparation for war. Requirements as well as prohibitions which tend for good condition are fairly well indicated in the Engineering Instructions of the Navy Regula-

tions. Although this is so indicated the good condition is not always arrived at. It is not only necessary to know what efficient condition is and should be, but also how this result is produced.

Condition is more important than a short burst of speed, a good showing in economy, or a considerable improvement in the original installation. If the machinery plant is not in good condition it certainly is not prepared for war, no matter what other result may have been obtained.

Actual condition is not, however, to be confounded with mere appearance; appearance of itself is not material for actual efficiency, but a good appearance, in a large measure, indicates a good condition.

The desired efficient condition requires:

(1) Every part to be in the most efficient condition for performing its designed work.

(2) As little wear and tear, corrosion, and deterioration as possible.

(3) The least possible renewals and the least expense.

Good and efficient condition is largely secured by guarding against careless breakage or damage, avoidable corrosion, unnecessary operation and service, unnecessary straining, makeshift or piecemeal repairs.

On the other hand good condition will be secured by insistence on cleanliness, repairing every defect at the earliest possible moment, doing all work thoroughly, avoiding useless and unnecessary work which by the very nature of things consumes time and labor that might be otherwise applied.

Obtaining good condition will be facilitated by proper instructions for all of the work and seeing the former carried out, having sufficient and proper time assigned for doing necessary work, intelligent action on the part of *all* the personnel, and a positive keen and intelligent interest in seeing that everything is kept in the best shape.

The intelligence and *esprit de corps* of the engineering personnel and the condition of the material are the two most important parts of our engineering preparation. Material in bad condition cannot perform its allotted functions even though it be operated by superior personnel under proper military control.

Condition is affected by service and operation during peace. Continued operation wears out and does not improve machinery,

and for this reason it is a mistake to use it just for the sake of operation. Some operation is necessary to get any mechanical apparatus worked into shape and in order to test and indicate its condition, but a relatively small amount is required. On the other hand neglect of machinery while standing idle soon causes it to deteriorate but this is not due to lack of constant use but to indifference, ignorance and neglect. Machinery can be kept in efficient condition with but very little operation when care and intelligence are applied to its preservation; therefore, it is certainly unnecessary to use the very costly method of running machinery for no productive purpose just to keep it in good condition. Running machinery does not put it in good condition. Operation wears out machinery causing expensive repairs and while it may indicate defects it does not repair them.

Condition will be affected by such influences as, nature of service, times allowed for routine overhauling and repairs, and also largely by the personnel. Damage, breakages and deterioration will be caused by carelessness; while inefficient personnel may, through ignorance, fail to take the proper steps to guard against deterioration; and insufficient personnel will not be able to make the necessary repairs.

Condition is indicated to a large extent, but not fully, by the performance of the machinery; good speed performance may be possible with boilers corroded to danger limit, condensers leaky and other important machines and their appurtenances in bad shape. Many matters of condition are largely shown by examination and inspection, and to test or indicate efficient condition it is necessary to have efficient examination as well as tests of performances.

Good condition may be brought about by large outside help or by a better utilization of the ship's force.

When the ship's force manifestly cannot do the work necessary to obtain the good condition it is naturally desirable and right to get outside assistance, and this of course means an additional expense. There is then the point of requiring a decision between the expense and the bettered condition it may or will produce.

ECONOMY

Economy should be considered only with a view to produce the greatest possible naval strength for the money spent. If a saving can be made by the elimination of waste, restriction of non-essen-

tials, or by improved methods, then the value of this saving may be employed in the production of more naval material. Anything saved from the running expenses should carry with it the possibility of adding just that much more to our naval strength.

Aside from oil and fuel the largest items of expense in the engineer department of a vessel are painting materials, packing, brass stock and tools. A large part of the painting materials is unnecessary for preservation and is only being used to improve appearances. Making efficient condition the prime requisite instead of good appearances, and the use of the most suitable and economical materials, will secure a very considerable reduction in the expenses of these items. Often this has been given little consideration or study, it being taken for granted that if the machinery is well preserved the expense of the preservatives might be considered negligible; and so it is a fact that in many cases the preservative is wasted and yet we fail properly to preserve the material.

The proper care of tools and spare parts, guarding against their loss and destruction, is an important factor in reducing expenses. Often little attention is paid to this, for in case of loss or breakage it is only necessary to call a survey in order to secure repairs and even renewals. Spare parts and new tools cause a very considerable portion of the expenses of engineer departments which can be materially reduced by a relatively slight amount of supervision, care and attention.

General economy in maintenance calls for the operation of the engineer department, and doing all the required steaming, at the same time keeping all parts in efficient condition with the least possible expenditure of money. This does not imply delaying necessary repairs or curtailing exercises required for military training. It would require that all work be done in the most thorough and economical manner; that no more supplies or materials are used than are absolutely essential; the use of such materials as are the most economical in the long run; and the avoidance of makeshifts.

The largest item of expense in the engineering department is that of navy yard repairs and alterations; and in their avoidance, or curtailment, is the largest field for engineering economy. This unfortunately is not always fully realized on board ship and often the asking for these repairs is taken as a matter of course and their

consequent expense not fully considered. The making of repairs should be looked upon as an evil that ought to be reduced to the lowest possible limit.

Economy must not be made merely on a few individual ships, and have these stand out as remarkable examples; but should be made general. A special saving on any one vessel may be small, but if it can be made on all the ships of the fleet it is quite another matter.

Economy is very largely affected by department and fleet orders as to steaming, exercises, etc., and they may be and, not infrequently, are given so as needlessly to cause considerable extra expense. Where the economical effect is more carefully considered in the issue of orders and the general conduct of exercises, a marked gain in general economy will surely result. The maximum economy cannot be secured unless the general economical effect is very carefully considered in matters of general administration.

It is of course possible that so-called economy may be so emphasized that it will detract from good condition and efficiency. It is evident that such false ideas must not be carried to such lengths, for *condition* and *efficiency* are always the first essentials though economy is of such vital import as to necessitate consideration.

Economy in the use of fuel and oil increases the steaming radius of a vessel and is of special military value, aside from the reduction of expense.

The key to victory may result by enabling a vessel to remain with a fleet, or by allowing the fleet to proceed at a higher speed and thus make it possible to effect some military object that it would otherwise be impossible to do. Steaming economy in peace times is important as a training and preparation for securing a large radius of action, besides promoting celerity of movement in time of war. Steaming economy is secured largely by avoiding small wastes and losses ordinarily considered too small to bother about—small annoying details. Knowing how to secure steaming economy is a matter that should be developed and determined in peace time, for it will be too late to begin after war is at hand. The information determined during ordinary peace work and in preparation for war ought to be at hand and should be a guide to be followed.

PERFORMANCE AND OPERATION

This in time of peace serves two purposes: (1) training and improvement of personnel; (2) indicating condition of apparatus and testing the machinery and its capacity, as well as opening the way for possible improvements therein. Performance and operation are, in time of war, the most important matters and the standard should be the prompt fulfilling of all demands within the capacity of the engineer department. This calls for efficient condition and capacity of both the material and the personnel. Vital things to secure are entire reliability and freedom from breakdowns.

Performances furnish data and information very valuable in future technical designs and construction, as well as to matters affecting military principles and considerations; thus serving as a basis upon which both technical and military operations may be based and plans made. Engineering performances in peace times are largely an indication of condition, and they are standards by which relative engineering efficiency may be determined, They therefore may be made most useful by making all possible performances simulate as closely as practicable the conditions under which they are to work in war time. They serve as a training for the personnel and without them little practical development of the engineering personnel would be possible.

In peace the only reason for engineering operations should be to secure:

(a) The mobility of the vessel for any military exercise.

(b) Development of the greatest amount of training and knowledge amongst the personnel.

(c) The largest amount of useful engineering data and information for both technical and military uses.

(d) Indications and information of the condition of both the personnel and the material.

The mere act of moving a vessel from one point to another is not the prime result to be achieved in the matter of naval preparation; but instead it is the knowledge and information obtained, and the training and experience given to the personnel. Mere movement of men-of-war is not the great, important thing till war time. Wearing out naval machinery during peace times, with little or nothing to be gained in any of the above fields, is decidedly questionable and very bad strategically.

SELF SUPPORT AND MAINTENANCE

The aim here should be to have no repairs requiring other than the ship's force to do the work. This is not always possible, due to accidents or damages which cannot be well repaired except by outside assistance. However, great care, taking proper precautions, and adherence to all safety requirements will tend to guard against any happenings that will make this necessary.

Outside assistance is largely required for renewals due to wear, tear and deterioration, and this class of repairs is chiefly to be avoided by taking proper care to avoid corrosion and prevent deterioration.

The practice of allowing repairs to be made by forces outside of the ship has the effect of causing less care to be taken by the ship's personnel, for if some one else has to do the repairing, the former will not be as careful as when they know that they themselves will have to make the repairs. Doing all possible repair work by the ship's force has the natural tendency to limit repairs, as well as forcing lasting and not makeshift work.

Thus from every possible point of view it appears most desirable to have a high standard of self support, and to secure within our ships the greatest capacity of self maintenance.

Self support is naturally a great aid to general engineering economy. This is by no means its only good point, for in addition it gives the great military advantage of ability to keep the sea and to maintain the effectiveness of the fleet. It is also a method that will help to improve the personnel, both in capacity as well as in skill; tending towards better data and information from the work done and the exercises carried out.

Self support is influenced most largely by the skill, capacity and sufficiency of the personnel, and by its efficient organization, and also very largely by the orders received from higher authority for various employments, movements and exercises. These last may be such as to make a large degree of self support impossible. While this may be excusable sometimes in time of war to gain some military advantage, in time of peace they would be most improper when the greatest military achievement of the engineer department is its efficient condition and reduction of expense.

IMPROVEMENTS AND MODIFICATIONS

So-called improvements and modifications, and modernizing, occupy a large share of the labor of our engineering personnel and cause a very high proportion of the repair expenses. The proper view of this matter would appear to be to make only such improvements and modifications as are really worth while and to make only such modifications as will really add to the efficiency of the fleet.

Modifications and changes are usually costly, and although they may often add materially to the efficiency of the vessel in question, the point is not whether this particular vessel would be more efficient, but whether the same effort and expense applied in some other quarter would not produce a larger increase in naval efficiency. It is essential to avoid change merely for change's sake, and the possible improvement should always be considered together with its probable cost. The change should be looked at from the standpoint of its military advantage and, whether the change will make the vessel, or more properly the fleet, more valuable for war purposes. It is also well to remember that the cost of the change is sure, while the value of the improvement is often a matter of conjecture.

Even if a change gives a material advantage, it is in many cases more advisable to make it in the next new ship.

Most small modifications should be restricted to those that can be made by the ship's force as this naturally prevents non-essential modifications. If the ship's force has to do the work there is better chance that the change is really needed and is worth while.

Large and costly changes should be most carefully considered, and the reasons for the proposed improvement should be very clear and convincing. Changes are expensive, and when they do not result in saving nor produce added efficiency, but only add perhaps a little to convenience, they should not be made.

Improvements that add to the general efficiency are very desirable and their discovery and development afford a valuable field for study and initiative, and criticisms and suggestions should always be welcomely received. It is chiefly by the progress of improvement that the engineering material is made, or can be kept superior to that of our possible enemies. Practical suggestions for improvement must come largely from observation and experience with the actual machinery in service; and,

therefore, it is very important to have continually in mind how the machinery could have been bettered both along military and technical lines. Where opportunity offers, it is essential that good suggestions for improvement be tested out and demonstrated in actual practice. Success in this is largely intermingled with, and assisted by, the determination and use of intelligent data and information.

Efficient improvements and modifications are largely effected by the character of personnel, which, if efficient, learned, capable, energetic and zealous, will make many substantial improvements. Maintenance of all machinery and appurtenances, as it is, in good condition, is short of the full aim. Where it is possible worthy improvements, modifications or additions, should be made and developed, for no chance of possible added efficiency or capacity for naval power should be neglected.

DATA AND INFORMATION

This is a matter of great value for the preparation of material and especially for developing improvements and remedying defects, and its importance is often overlooked, and due credit for work in this field may fail to be given. Improvements in design and operation are based on deductions from proper data obtained from performances. If not obtained, proper conclusions as to the value of different constructions or methods of operation cannot be secured. Recorded data of previous performance indicate whether the present is better or worse, and without data the possibility of improvement is remote.

Data should be collected to use, not merely for the sake of taking them and making a report, or filling out a blank form. The system governing their gathering should call only for that which is going to be of some value. Sufficient data having been secured, they should be properly summed up, analyzed, and a reasonable conclusion determined, which having been done, the change or operation suggested by the conclusion should be put into practice. Data are of no practical benefit unless the information obtained is used and put into practice.

As improvement and development in naval engineering are so largely dependent on the determination of accurate data, it follows that this matter should be accorded its proper consideration by the personnel afloat in order that the largest amount of the most

useful information may be obtained. The information gained can be used for future operations on the vessel, for strategical and tactical purposes in connection with the handling of the vessel or fleet and also for purposes of design of material.

To be of value data must be not mere guesswork, but as accurate as possible, and should express the attendant circumstances and conditions without extravagant claims. They must be real data, not hopeful imagination. That this is sometimes the case is shown by reports of some extraordinary saving caused by some slight alteration. Some of these claims bear inaccuracy on their face and are evident exaggerations. Conclusions from meager, incomplete and perhaps inaccurate data are to be avoided.

The distribution of information is of the greatest assistance in naval engineering. If an engineering department of a vessel does something well by a new method, the circumstances should be reported and the information properly distributed for use on other vessels, so that the general engineering efficiency of the fleet may be proportionately increased, which will not occur unless the discovery is promulgated and distributed so that all the ships can use and develop the idea.

To use and collect data intelligently the engineering problem involved must be understood and it should be known what is to be determined by the data taken. The proper gathering of data and their valuation require engineering knowledge and expertness on the part of the engineering personnel, and these must be more than the mere knowledge of operation. A full understanding is required not only of the engineering problems, but of their relation to the military end in view. A high degree of professional attainment on the part of the engineering personnel will result in securing the best data and information upon which future improvement in design and construction may be based.

The taking of data is often regarded as a bugbear and an unnecessary side issue and handled merely as a troublesome routine. This is unfortunate, for it is very essential that all engineering personnel in the navy should appreciate the value of proper data and information.

PREPARATION AND TRAINING FOR BATTLE CASUALTIES

Maintaining the machinery in operation during battle is of course the ultimate object for all engineering preparation. The making of provisions for obviating the effects of any casualties, and guarding against them, will require most careful thought and consideration by the engineering personnel. A minor accident if not properly attended to may cause a panic and throw a large part of the machinery out of operation; and it is therefore pertinent that a study be made of the various possible casualties and derangements that are likely to take place in a battle, and then determining their remedies, and providing all possible means for their avoidance.

The matter of guarding against casualties will consist in making sure that armor gratings and battle hatches are down and in place; that all possible unprotected steam and other pressure leads are cut out; that all valve lifting gear is in order and intelligently manned, and that all gear and material not permanently secured are so fixed that they cannot be deranged or misplaced to such an extent as to interfere with any of the operating machinery, or comfort, convenience and safety of the personnel.

Damages in action may be of a great variety, such as ruptured steam or water pipes, burst boiler tubes, loss of feed water, pierced uptakes, flooded compartments, disabled machinery, etc., and to cope with these disasters it is necessary to have a force of men who will know immediately how to cut out the damaged pipe or boiler, how to isolate the compartment so as to avoid disturbance to other parts, how to put the stand-by machinery or auxiliary in operation, and how to handle themselves so as to avoid being smothered, burnt or otherwise injured. Instantaneous knowledge of how to pump out any injured compartment and how to avoid and remedy any dangerous heel or trim may, at a critical time, enable the ship's battery to be kept in action. It is not sufficient that a few officers understand what these things mean, and how to do them, but the knowledge should be there present with the men at the spot where the accident happens, and in order to do this all the personnel must be specially trained along these lines.

Proficiency in this matter can be specially developed by instruction, drill and training, and the various operations should be actually done as far as possible. It will not suffice merely to give

a few general instructions to the men at various stations, for in order to insure proficiency the men must have actual experience performing the various needed operations, and must know at once what to do without a lot of discussion and questioning. This depends largely upon the organization, drill, training and knowledge of the personnel.

In case of accident it is essential to avoid a panic by seeing that the compartment where the accident occurs is isolated so that its effects may be restricted as far as possible. Practice at casualty drills and careful and repeated instruction in the causes and remedies for various possible accidents should be thoroughly gone into by all our engineer departments afloat.

ENGINEERING COMPETITION SYSTEM

In order to create special incentives to stimulate efforts for securing engineering efficiency there has been provided in our navy the system of engineering competition, and in this we are pioneers.

It appeals to the personnel in two general ways:

(1) The desire to excel and to be recognized as winners.

(2) The securing of a tangible individual reward.

To attain results in the latter case, particularly, money prizes may be given. It is believed that the practice of giving individual money prizes should be combined with the giving of trophies to the best vessel and otherwise singling out the winning ship and crew. By so doing there is a double appeal and a tangible individual reward. The incentive for the exertion of the best efforts then acts both individually as well as collectively.

The rules for the engineering competition would naturally be prepared so that they will produce the attainment of the best engineering standards. The rules may be so based that the spirit of competition will cause the efforts to be taken in some proportion to the value of the particular result desired. Thus, if *economy* is considered of greater value, the rules may cause special incentives to be given for being economical. If *good condition* is to be the paramount aim it would be singled out and emphasized by the rules. Likewise if any other engineering feature is of particular importance the rules may be arranged to give it special weight in order that greater attention may be paid to it.

By throwing the weight from one thing to another the system of competition can be employed to produce development or improvement in any particular direction that may be desired. A thorough and careful consideration of the best standards of engineering performance is the logical basis upon which the rules of an efficient system of engineering competition should be developed.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE DAY TORPEDO-BOAT ATTACK

By LIEUT. COMMANDER ROMEO BERNOTTI, Royal Italian Navy
Translated by LIEUT. COMMANDER W. N. JEFFERS, U. S. Navy
(*Rivista Marittima*, February, 1914)

Until a few years ago the day attack by torpedo-boats was considered a possibility against crippled ships only, as in the case of the *Souvarroff* at Tshushima. Its employment against uninjured vessels was considered justifiable in certain cases on account of the advantage which might be gained through the confusion caused in the enemy's formation, even though there were no other result.

To-day, the longer range of the torpedo and the increased size of the battleship—with the consequent importance to be attached to the destruction of a unit representing such a concentration of power—lead us to believe that the possibility of the day attack is increasing, and to formulate our ideas upon the methods by which the attack is to be delivered.

* * *

If two torpedoes are fired at the same target, we may apply the the term "difference in paths" to the difference between their respective distances from the center of the target as they cross its course.[1]

It is evident that, if several torpedoes are fired "in multiple," or "in salvo," from a torpedo-boat, at the same target, the difference in paths between two adjacent torpedoes should be a little less than L, where L is the length of the target.

In fact, the requirement that there should be a sufficient dispersion of the torpedoes, that is to say, an appreciable divergence of their paths, follows from the fundamental axiom which, in a former article, we stated in the following terms: "Dispersion of the shots of a salvo is a desirable thing in gun-fire, but it is not to be sought after in the case of torpedoes. A similar case in gun-

[1] The author evidently refers to *algebraic* difference.

fire would be one where the conditions would be such that we could not improve the firing owing to inability to observe the points of fall of the shot, and each shot being capable of destroying the target."

It may be asked whether it would be disadvantageous if the difference in paths of two adjacent torpedoes were greater than L. The answer is in the affirmative. In fact, it is sufficient to bear in mind the width of the zone which includes 50 per cent of shots, which, in the above-mentioned article, we calculated for a 9000 meter, 25-knot torpedo, assuming mean errors of ± 2 knots in estimated speed and of $\pm 10°$ in estimated course of the enemy, and assigning a speed of 18 knots to the target. With these data—which are most favorable to the torpedo—and with the angle of impact corresponding to the minimum width of the above-mentioned zone, we find the latter to be about 500 meters for a run of 5000 meters. And since, according to the theory of probabilities, the necessary width of the zone which will contain all shots is four times the width of the zone which will contain 50 per cent of them, it follows that in firing torpedoes with mean errors within the limits mentioned, it is not improbable that the deviation of the torpedo from the center of the target will be rather considerable. From this we conclude that, in firing torpedoes, the center of impact may be decidedly to one side of the center of the target, and that, therefore, torpedoes should be fired so that they shall form an impassable chain; in other words, the difference in paths between two adjacent torpedoes should be not greater than L.

A fortiori, it is not logical to allow a dispersion greater than L between two adjacent torpedoes on the ground that the target consists of several ships in formation; since, with the number of torpedoes carried by a torpedo-boat, the attempt to hit several targets means to hit none at all.

Let us assume, then, that a torpedo-boat fires in such a way that the difference in paths between two adjacent torpedoes is a little less than L. Under such conditions, it may be observed that, with ships about 200 meters long, cruising in column at 400 or 500 meters, the formation may be considered a continuous target for a salvo of three or more torpedoes. In fact, it is evidently not possible that all the torpedoes of a salvo fired in this manner should pass between the ships of the formation; it

therefore follows that unless all the torpedoes pass outside the limits of the formation, there will be at least one ship hit.

A modern destroyer with more than two tubes on a broadside has, therefore, a sufficient number of tubes to fire a salvo such that two or more ships in column may be considered as a continuous target.

Now, from a study of the battleship tactics of the different navies, the strength of the division appears to be fixed at four ships, and it may be assumed that at least the ships of each division will be in column. We may therefore base our argument upon the assumption of a target equal in length to a column of four ships. In the case of a single torpedo-boat, therefore, it is evident that the torpedoes should be fired so that the central trajectory shall, theoretically, pass squarely through the center of a division.

With this in mind let us attempt to establish rules for the employment of a large body of torpedo craft.

* * *

The only rational method of delivering the day torpedo-boat attack is by sending in a large number of boats simultaneously against the same fraction of the enemy's fleet.

The following remarks will help to illustrate this statement:

Naturally, a condition necessary to success is that the torpedo-boats shall remain exposed to the enemy's fire for the shortest possible time; with the large number of guns of medium caliber carried by the modern battleship every instant is precious, and any slight delay in arriving in firing position means a needless sacrifice of torpedo craft.

There are characteristic differences between the attack by night and the attack by day: in the former, the assailant counts upon the element of surprise and upon the difficult conditions under which the enemy must fire; the attack can and should be delivered at close range, in order to compensate for the slight chance of making a hit. On the other hand, in the day attack, delay means failure for the attack, which not only is conditional upon the position of the assailant in the bow sectors of the target ship, but which also must be delivered with the tubes in extreme forward train, when it is barely possible to fire.

In the day attack, therefore, the torpedoes must be fired at long range, without giving too much thought to the angle of impact,

or, more exactly, it is necessary to give up the idea—really superfluous at the present day—of having this angle in the neighborhood of 90° in view of the fact that, however great the speed of the enemy, the change in his bearing from the torpedo-boat is *comparatively* slow at long range.

Granting this, however, it must be borne in mind that, under similar conditions of the angle of impact (that is to say, with angles of 30° to 60° from the course of the target) one torpedo, considered by itself, has only the very slightest chance of hitting; hence, we must remedy this by firing many torpedoes with suitable dispersion.

With a considerable number of boats available it would not be logical to deliver successive attacks, since the various subdivisions would be destroyed piecemeal; such attacks would not accomplish the result of confusing the enemy's line of battle, that is to say, they would not induce his ships to maneuver in a manner not called for by their tactical situation relative to those of his adversary, and there would be even less reason for hoping to hit any ship with a torpedo. It might be objected that a mass of torpedo craft would offer too large a target: for the present, let us confine ourselves to a recognition of the logic of the mass attack, leaving until later the investigation of the proper form of attack in order that the mass of boats shall not offer too deep nor too wide a target.

If the number of boats permits, it is proper to distribute them in widely separated groups in order that at least one group may be in a position favorable for attack. This, however, is subject to the condition that the existence of every group shall be in accordance with the principles we have laid down; it would not be logical, merely because these groups exist, to scatter the attack of a large body of boats over different divisions of the enemy's battleships.

In other words, the principle of concentration holds in the case of torpedo-boat attack to the same extent that it does in the artillery combat, although the manner of applying it be different. We must not risk the attainment of one object by trying for too many at once; and in order to obtain indirect advantage from the action of the torpedo vessels, that is to say, from the relative maneuvers of the lines of battle, the threat must be real and not weakly expressed.

In the mass attack we might be led to forget the fundamental axiom that there must be suitable dispersion between adjacent torpedoes; in fact, it might be thought that the greater number of torpedoes would allow a concentration of those from each boat or of those from each primary subdivision of the flotilla. In so doing, however, we should be losing sight of the fact that we have recourse to the mass of torpedo vessels in order to compensate for the slight chance of hitting with a single boat; we increase the number of boats in order to be able to fire at a longer range and attack under conditions where there would be only the very slightest chance of success for a single boat or primary subdivision. The fundamental axiom, therefore, retains all its importance, although, by virtue of the large number of torpedoes, we may accept a decrease in the difference between the paths of two adjacent torpedoes, but only because it allows us to obtain great simplicity in our rules for firing, since it is evident that this simplicity is a factor essential to success.

The ideal arrangement, therefore, would be to have all the torpedoes of the flotilla centered, that is to say, they should be so aimed that the mean trajectory will pass directly through the center of the target division, and that the difference between the paths of two adjacent torpedoes, even though fired from different boats, will be a little less than the length of any hostile ship. In practice, we must establish such rules for firing as will allow of as near an approach as possible to this ideal condition.

* * *

Let us remember that, in firing torpedoes from a single boat, there are two methods by which the desired dispersion may be obtained:

1. Simultaneous firing, or the salvo method proper.
2. Firing in succession, with extremely short intervals.

The first method is possible provided the tubes are capable of continuous train with the same ease as a gun. In this case, with the setting of the central tube established, the angles for the others are easily determined from a table in functions of the range and the desired divergence between the paths of two adjacent torpedoes.

Given the difference in the settings of the tubes, and having them all pointed at the target, we shall obtain the desired divergence among the paths of the torpedoes.

With the second method, successive firing, the tubes are fixed in position, parallel to one another, in a pre-established angle of train. In the case of only two tubes they may be given the same angle of aim, arranging that one shall fire when it bears on the bow of the target, and the other when it bears on the stern. With more than two tubes it becomes necessary to assign different angles of aim, as in the preceding method, each tube firing as it bears on the target.

The first method is evidently especially desirable for the day attack, since, as we have already said, even seconds of time are precious; the other system is, however, imperative when the tubes are not capable of continuous train.

There is no need of dwelling upon the details of these methods; we have recorded them merely in order to show that each vessel will fire in the manner allowed by her construction, and that, as we have already stated, the effort must be made toward having all the units of the flotilla fire almost simultaneously; in other words, the whole flotilla must fire in about the space of time required by a single boat.

* * *

We shall call the angle of aim of a torpedo vessel that adopted for her central tube.

Evidently, the desired dispersion among the torpedoes may be obtained through the spacing of the boats, the adoption of suitably chosen angles of aim, and a diversity in the points of aim in the adversary's formation.

In order to choose the method which will be best in practice, let us observe that the elementary subdivision of a flotilla may be regarded as that in which the number of vessels permits of the approach being made in column without offering too deep a target to the enemy's fire. It seems that this elementary subdivision should be the division of three boats, distance being established at 100 or 150 meters. This distance could not be increased without entailing serious difficulties. It is self-evident that division leaders must be separated by the interval of deployment; it is, however, clear that, in order that the various divisions may arrive simultaneously in position for attack, division leaders must be deployed on a line approximately at right angles to the bearing of the center of the target division from the center of the formation of the torpedo vessels, and, therefore, increasing the distance

between vessels of the same division will result in the entire mass of boats offering too deep and too extended a target.

The length of a division of torpedo vessels would thus be about equal to the distance between two battleships; and this, as we shall shortly demonstrate, is an arrangement suitable for the attack.

The adoption of different angles of aim among the torpedo vessels may seem correct from the theoretical point of view; however, it seems best to give up this idea in view of the complications we shall encounter. It is certainly better, for the sake of simplicity, to adopt a single angle of aim, to be signalled by the division commander when advancing to the attack, and which is the one corresponding to the mean conditions assumed. For example, we may assume that the angle of aim adopted is that corresponding to the estimated speed of the enemy and to a position of the torpedo vessels 45° on his bow.

In aiming, it will be remembered that the points of aim offered by the enemy's formation are the center and the ends of each of the ships attacked.

* * *

Before explaining how it seems to us that the approach and attack by a flotilla could be accomplished, we give the following as the method by which the firing of torpedoes may be executed by a division.

The division, assumed to bear about 45° on the bow of the enemy, steers as though to meet him; the boats follow their respective division commanders by successive movements. Tubes are held in readiness in extreme forward train, on the side which is away from the enemy during the approach. At the moment the division commander deems proper he changes course so as to unmask his tubes and fires his torpedoes. Each of the following boats, without waiting to get into the water of the next ahead, likewise changes course at an opportune moment afterwards, brings the tubes to bear, and fires at the point of aim which has been assigned to it in the manner we shall now indicate.

* * *

We believe that the employment of a force of four divisions of torpedo vessels for the attack upon a division of four ships may be considered typical.

With this granted, let us suppose that such a force of boats has been kept out of range of gun-fire and has reached a position relative to the enemy such that there is reason to expect a successful attack.

The flotilla approaches in a single column, following the flotilla commander, in such manner that the entire force is deployed perpendicularly to the bearing of the center of the division to be attacked from the center of its own formation. The deployment being completed, the division commanders, followed in succession by the units of their respective divisions, make a simultaneous change of course and head for the corresponding ship of the enemy, steering so as to keep headed for it, and following approximately the shortest route of approach, being careful under no circumstances to get inside the interval established between each other. In other words, the commander of the first division steers so as to keep headed for the leading ship, the commander of the second division, for the second ship, etc.

The result of following such a rule will be that the line of bearing of the division commanders will remain nearly perpendicular to the bearing of the center of the target division from the center of the force of torpedo vessels, so that the divisions will reach simultaneously the firing position. At the proper moment division commanders change course simultaneously and bring their tubes to bear, followed by the boats of their commands in the manner described above. Vessels of each division fire respectively at the bow, center, and stern of the enemy's ship assigned to their division.

This is a system which seems to approximate closely enough to the theoretical requirements in the simplest manner allowed by the necessities of practice. A similar attack possible of trial even at a range of 7000 or 8000 meters, with sufficient chance of success, or with a chance of success at least proportional to the risks run.

It will be objected that the enemy will not fail to deliver a counter-attack with his destroyers. It is to be observed that, in this way, he will blanket the fire of the battleships; in any case, torpedo defence is not the subject which we proposed to deal with in this article, which is confined simply to setting forth an idea as to how the day attack by torpedo craft might be delivered.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TACKING A NAVY CUTTER

By Lieutenant A. C. Stott, U. S. Navy

With the increasing use of the gasoline engine in all types of small craft there will probably be less and less occasion for the management of navy cutters and whaleboats under sail than there was even in the few short years ago that "I was a midshipman."

However, the use of sails in our small boats will never entirely cease in the fleet, and even if their employment does become less frequent as a matter of necessity, there will always be many of us who will turn to an occasional sail as a matter of pleasure. Then, too, there are always the races and regattas that form so attractive a part of our fleet contests.

It was the writer's privilege, some years ago, to be shown by an older officer how a navy cutter could be brought about in a shipshape and seamanlike manner, without fear of mis-staying. Since that time I have spread the information whenever possible by example and conversation. This article is presented in the hope that some small boat enthusiast may be induced to try the method outlined, and that he will be as successful with it as I have been.

If I am repeating or infringing upon other articles upon this subject I hereby tender my apologies to their authors. Personally, I have never seen these instructions for tacking in print, although they may now be embodied in a later edition of the "Ship and Gun Drills" than the one with which I am familiar. If they still have sailing drills at the Naval Academy I can recommend a trial of these suggestions to those concerned.

To perform properly the evolution of tacking the navy standard

Sliding-Gunter rigged cutter requires a station bill as follows, in addition to the man at the helm:

Man at main sheet,
Men at fore sheets, both sides,
Men at jib sheets, both sides,
Man under foot of foresail,
Man under foot of jib.

Other men in the boat may be distributed to bring the weight where the particular boat in question needs it to sail her best, and at least one more can be employed to advantage to assist the man under the foresail.

Suppose the cutter to be sailing close-hauled on the port tack, and it is desired to come about.

If she has fair headway, and the sea is not particularly rough, it will not be necessary to give her a full for stays, but if the breeze is very light, or if the boat is pounding into a head sea it will be advisable to keep her off a point or so.

At the order "Ready about" the men take their stations as outlined above.

At "Ease down the helm" the helm is gradually eased down and the main boom is gradually brought amidships, but never beyond the center line. (A good order to give the man at the main sheet is to "Hold the boom over the head of the rudder.")

As the boat's head comes to the wind have the men at the fore and jib sheets *take in* on their starboard sheets as the slack comes to them. (This will require attention, as there is always a tendency to throw these sheets off as the sails begin to slack.)

As the boat's head passes the wind and the foresail fills from the starboard side have the men under the foresail grasp the bottom of the sail and carry it bodily across with the wind, that is, not force it over, but carry it over with the wind, keeping it from flapping, and shifting the sheet smartly as the foot of the sail goes across. If this sail is handled properly it will never give a flap from the time it is full on one side until it is full on the other, and, consequently, it will never lose its driving effect. (Care should be taken not to shift it until it has the wind well on the new side.)

Meanwhile the jib, held down by the starboard sheet (now the weather sheet), will have the wind well on its starboard side,

and will be forcing the boat's head rapidly around toward the new course.

When it is seen that the boat is well around and in no danger of mis-staying, shift over the jib sheet smartly, the man under the jib carrying the foot of the sail over as was done with the foresail. If done properly the jib should never flap.

The main boom needs no further attention after it is carried amidships, other than to keep the sail from flapping and to ease it off to the proper trim after the sails are full. If the boat is to run free after coming about the boom will have to be eased off smartly, but if going close hauled it should be kept well in on the quarter.

From my own personal experience I am convinced that no one who has ever seen a cutter tacked in this way will ever allow himself or one of his coxswains to jam his main boom over and throw off the jib and fore sheets while an oar is frantically paddled to leeward under the thrashing foresail in an effort to get the boat around to the other tack.

It is far better to *sail* a boat around in this way, than to try to *shoot* her around, and the amount that can be made to windward by a few tacks in this method will be a surprise to those who consider a cutter too unwieldy to "Get anywhere."

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

MEASUREMENT OF THE LAG IN THE TIME SERVICE

By Ensign Robert A. Lavender, U. S. Navy

Another novel use of the wireless telegraph has lately been developed at the U. S. Naval Observatory in the determination of the lag in the telegraph lines which supply the United States with the correct observatory time. It has always been a matter of conjecture just how great this lag is and whether or not it is constant, but no accurate tests over lines with many relays have as yet been published. Recent experiments made at the U. S. Naval Observatory have shown that for chronometer comparison, for computation of rates, and for scientific observations considerable error may result if this lag is not determined and taken into account.

The general plan of determining this lag, or the interval of time between the instant the circuit of the sending clock is closed and the instant that the signal is sent out by radio at Key West, is known as the coincidence method. The instruments used are divided into two parts: (a) an apparatus for sending a series of signals, each of a duration of about three-eighths of a second, over the line of which the lag is to be measured; and (b) an apparatus for sending a separate series of signals to which the signals of the first part are referred and compared.

The first part, as shown in group *A* of the figure consists of a clock *1*, operating a make-circuit contact every second, connected to a relay *2* the secondary contacts of which may be thrown by a double-pole switch *3* either to (a) a buzzer *4* situated in the time room, or (b) to a relay operating the circuit in the land telegraph line to the radio station at Key West. From the splice between the two coils of the buzzer is led a line *6* to the primary tuning coil of the radio receiving outfit *B*. Impulses from the buzzer are thus connected to and made audible in the same set of phones that receives the radio signals. The appara-

tus furnishes, then, a means of producing in a set of telephone receivers a series of signals (short buzzes) either direct from the time room via line *6* or by way of the land telegraph lines to Key West and back by radio.

The second part (see group *C*) is made up of a break-circuit chronometer *8* with two parallel circuits: (a) a resistance and battery; and (b) a condenser and a tuning coil, which is like an ordinary induction coil with the additional feature of adjustable coupling. When the secondary of this coil is connected to the telephone receivers a sharp tick is heard every second as the condenser is charged by the battery. A series of ticks is heard from the chronometer, which forms a base to which the signals of the clock are compared. By the use of the coil *10* the beats of the chronometer are adjusted to the same intensity as the clock signals. This is necessary in order that the signals of one may not drown out the other at the moment of coincidence and make comparison less accurate or impossible.

If now the clock be made to run faster than the chronometer, say to gain one second in 85 seconds (by the clock) there will be a series of times when the beats of the chronometer will coincide with the signals of the clock. These coincidences will occur every 84 seconds by the chronometer, or the number of seconds by the chronometer that are required for the clock to gain one second. Three series of coincidences or comparisons are taken: (a) between the beats of the chronometer and the signals of the clock direct (via line *6*); (b) between the beats of the chronometer and the signals of the clock, via Key West and back by radio; and (c) as a check, a second series between the beats of the chronometer and the signals of the clock direct.

The method of reducing the data is as follows: the difference in time between the first and the last coincidence, divided by the number of coincidences will give the average time or interval between coincidences. All the coincidences are then referred to the last one by adding to each coincidence the average interval multiplied by the number of intervals between that coincidence and the last one; in other words the coincidences are averaged by determining for each coincidence what the last one would have been had all the following coincidences been perfectly judged and recorded.

phone
from
lines

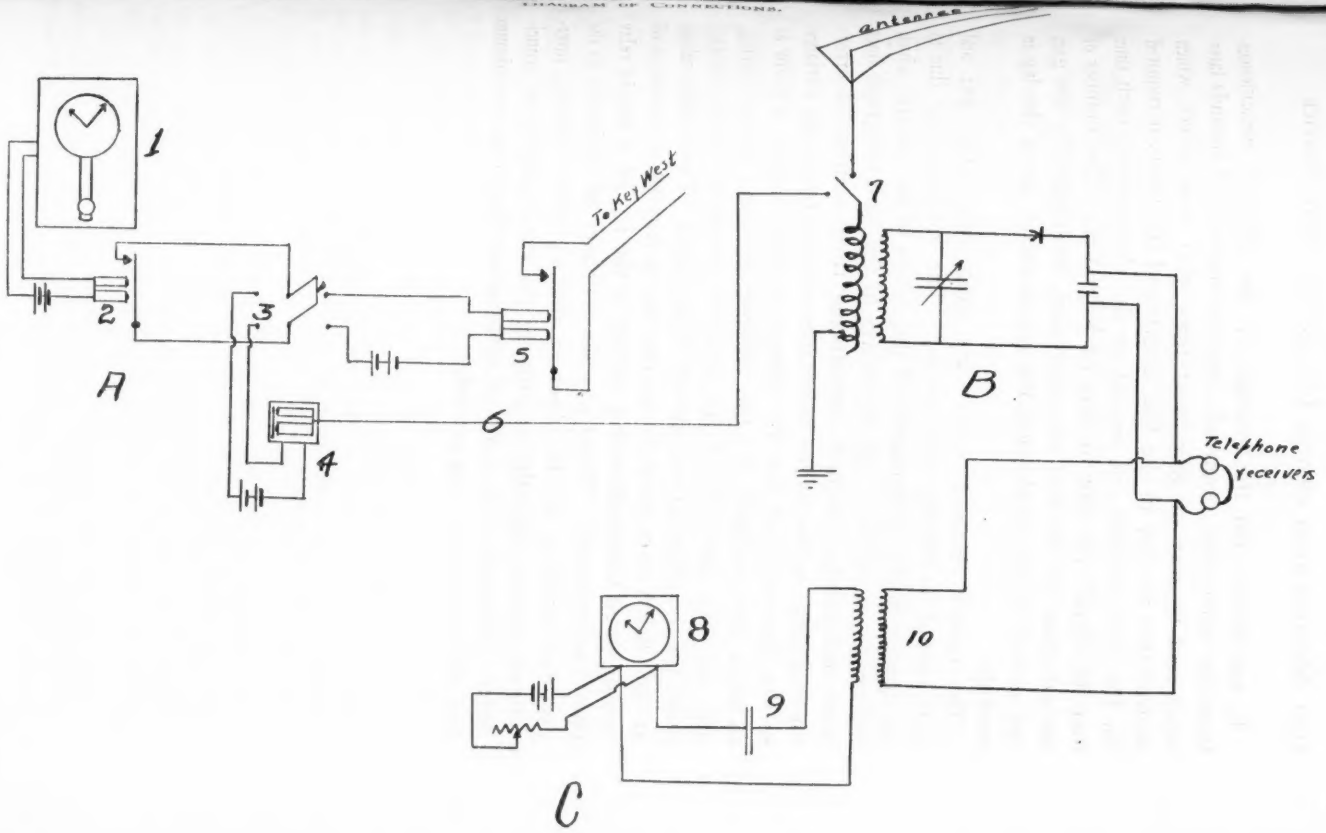
ircuit
e and
s like
ijust-
ed to
as the
ks is
h the
o the
ty as
ls of
dence

eter,
e will
r will
s will
er of
gain

s are
gnals
f the
back
beats

rence
y the
erval
ed to
erval
dence
aged
ould
ectly

DIAGRAM OF CONNECTIONS.



It was found that the average of the referred coincidences from the same relay, occurred a definite number of seconds later when sent by way of Key West than when sent direct, which showed that the lag in the line lengthened the interval required for the clock to gain one second on the chronometer each time that the signal was sent by way of Key West. The number of seconds that the interval was increased, multiplied by the gain per second of the clock over the chronometer, gave the lag in seconds.

The results obtained were: .311, .327, .364, .262, .304, and .326 second, averaging .316 second. The variance was due to the change in the adjustments of the relays in the circuit, which were eight in number. All the relays in the land telegraph lines were make-circuit contacts introducing three sources of error: the magnetic lag due to the inductance of each relay, the variance in the time required for the current to rise to such a point as to move the armature for the different tensions of the spring, and the time required for the armature to move to the contact point for the different settings of these points. Tests with relays at the Observatory have shown that there may be a variation of two or three hundredths of a second in the lag of a single relay due to adjustments. There was also a chance of variation in the personal equation of the observer due to weak signals, interference and the difficulty in judging the exact second of coincidence. However, this source of error was reduced to a minimum and did not exceed .003 second.

DISCUSSION

The Military-Industrial Organization of the Navy

(See Page 689, Whole No. 151, Vol. 40, No. 3, May-June, 1914)

Assistant Naval Constructor J. E. Otterson, U. S. Navy.—In venturing a discussion of Lieut. Commander Thomas A. Kearney's paper on "The Military-Industrial Organization of the Navy," I do so as a "student of industrial organization" who has found that "the navy of the United States affords an excellent and profitable field of study."

I hope that in this venture I may not be classed among "those who fanatically worship at the shrine of the goddess of peace, or the more utilitarian few who would clutter the decks of fighting ships with the goods and samples of our manufactured or commercial products." If in the course of this discussion, I should advocate "the creation of an exclusive and specialized naval industrial corps, be it military, semi-military, or wholly civil, holding life tenure of office, and charged only with the management of industries that may vanish over night," I hope that it may not be charged by those "naturally and properly suspicious that motives purely selfish may be behind these demands for change."

While I am not able to agree with the author in all that he says, or to find his arguments entirely logical, yet I must concur in many of his beautiful sentiments and hope occasionally to find myself "stimulated by the highest ideals."

I would not be remiss in expressing my appreciation of the military point of view and cannot do better in expressing my own sentiments than to quote the author's eulogy of the military man:

"The military man is essentially a leader, exercising his leadership when 'responsibilities are terrifying and the greatest resource of soul is required to make decisions.' He is a student of men in every sense of their being, a leader stimulated by the highest ideals, attaining to greatness and success through the men he leads, satisfied only when he knows his work has been well done, asking no greater reward than the gratitude of his fellowmen."

In fact, I find that this conception of the military man permeates civil as well as military circles and, as I have long since separated myself from any claim to military distinction, I hope to escape the accusation of immodestly drawing these remarks to myself, but on the other hand, I trust that modesty will not make me unmindful of the merits and high ideals of other branches of the service.

The author desires to have accepted "as axiomatic, that the navy as an entity exists primarily, and is at all times a military organization." He focuses "the spotlight upon the fact that navy yards and shore stations

exist for the fleet." He wishes "no denial of the military purpose of the navy, individually or in the aggregate." "Drills, exercises, evolutions, target practices, war-games, repairs, and overhaul, have but one avowed and recognized purpose: the training and preparation for war." "Navy yards exist, even as does the fleet, for war." "Navy yards are not eleemosynary institutions wherein men may attain to life-long sinecures. They are the military-industrial stations where vessels belonging to the military branch of the government may be constructed, repaired, and fitted out for the performance of their military purposes." "Navy yards and all that they contain are but one link in the chain of readiness, or near readiness, that permeates the entire navy."

In all of this I am pleased to agree most heartily with the author, and I am surprised to read his statement that "unfortunately, the American people are not a maritime race, else it would be easier to bring home the force of this argument." There seems to me no room for argument on these points. It amounts merely to saying "The purpose of the navy is military." No one need dispute this purpose.

But surely, as to the manner of attaining this purpose, authorities may differ without being charged with "motives purely selfish."

For example, it appeals to me that the navy yards can best fulfill their military purpose if they are industrially efficient and I believe that the first step necessary to industrial efficiency lies in the appointment of industrial managers and the placing of the yards upon an industrial basis. This is not separating or divorcing the yards from the navy, or opposing them to the great military purpose of the navy; it is merely giving them an opportunity to attain to the efficiency necessary to cause them to best serve their purpose.

The navy yards are military only in the sense that their industrial efficiency is necessary to the military efficiency of the navy as a whole.

The author states that "the commandant, in his dual capacity of military and industrial senior, is the general manager of the manufacturing department—the department to which are assigned the shops, manufacturing and repair facilities of the yard." I do not fail to appreciate the frankness of his admission that "it is this dual capacity that, perhaps, puzzles the outside observer."

The author quotes Professor E. D. Jones on analogy and makes a plea for "strictness of analogy" objecting to the substitution of "men for cells, and the nation for the human body," for the mere purpose of emphasizing group specialization. He later cites "an illuminating example in the industrial organization of our railroads" that to my mind is in no sense analogous to the naval situation, or at least wholly lacking in its presentation that strictness which the author so much desires.

To quote the author, "engines, cars and equipment are purchased in the open market subject to inspection, but what road throughout the length and breadth of the land is dependent upon outside plants for the repair, overhaul and upkeep of its roadbed or equipment? The repair stations, roundhouses and division shops are to our railroads what navy yards are to our ships. We do not for a second question the propriety of a railroad

managing its own shop. Why then should we have the temerity to question naval management of things essentially naval?"

I am unaware that anyone has seriously questioned naval management but I do know that there are many who seriously question military management of naval industrial affairs.

In order to make the railroad situation analogous to the naval situation, one must imagine the brakemen, conductors, and locomotive engineers in charge of the railroad "repair stations, roundhouses, and division shops." I believe that the propriety of such management of the railroad shops might well be questioned, although the railroad would still be "managing its own shops."

I may perhaps be pardoned a further quotation from the author's paper as it seems to me he both makes and answers his arguments. We learn that the war game "presupposes that the man in the conning tower has officers and men under him capable of making the big ships and the little ships go where he wills to take them. The uninitiated may ask what constitutes this ability to make the ships go to the place where the admiral would take them. Briefly, we may answer, the knowledge of navigation, tactics, electricity, steam engineering, mechanics, seamanship, and the leadership of men. It is the ability to pick the trail across the many waters, to avoid shoals and hazards, to keep the day's reckoning. It is the ability to produce and use both electricity and steam in the various mechanical appliances to be found on board a 30,000 ton battleship or a 1000 ton high-speed destroyer; to operate, maintain, and repair dynamos and generators, main engines, turbines, auxiliaries and boilers; to handle the ship in fair weather and in storm; to organize a crew, taken from the city and farm, into a happy, industrious, capable unit, to feed them, work them, drill them, educate them, yea, mother them, so that when the day comes you can fight them to the everlasting glory of the United States and of the flag under which they serve."

Truly, any man is to be congratulated with such a broad field of splendid opportunities open to him. In view of the contentions of the author, I may be pardoned my surprise at not finding an adequate reference to the duties and qualifications of an industrial manager. The omission means much, to my mind, and I believe that it was wholly involuntary and unconscious on the part of the author and further, that the average line officer in summing up the qualifications which constitute his "ability to make the ships go to the place where the admiral would take them," would just naturally fail to mention his knowledge of the relative merits of day work, piece-work, premium, and bonus systems of pay, of the progress of syndicalism, of the practice of sabotage, of trade unionism, of the I. W. W., of the politics of time study, of the merits of scientific management, of the effects of industrial fatigue, of workmen's compensation acts, of industrial accidents, and vocational diseases, of the psychology of management, of shop buildings, of shop layouts, of direct drive, of belt drive, of all these and more.

And furthermore, to include such qualifications in those necessary "to make the ships go to the place where the admiral would take them" would make the whole thing absurd. And yet these things are not absurd to the

industrial manager but are vital and are part of the problem of efficiently handling the work of constructing and repairing our ships. It is work essentially industrial in its composition even though performed for a strictly military purpose.

The author states the purpose of the present navy yard system to be as follows:

(a) To secure the earliest practicable beginning of work.

(b) To prevent an undesirable accumulation of material in shops.

(c) To properly follow up work.

(d) To secure best machine tool results and fix standards.

These purposes are all industrial.

I would state more broadly that the object of any navy yard system is to build up the industrial efficiency necessary to the fulfilment of their military purpose.

I hope that I may not be considered as wholly lacking in sympathy for the military point of view if I should venture that under proper industrial management our navy yards may assist greatly in the solution of the great social, political, economic, and labor problems that confront this great country and find expression in labor strikes and I. W. W. demonstrations. Surely this is a broad field that at best would surely prove distracting to the military man.

I note the author's inability to picture a semi-military corps and his objections to the hyphenating process, and yet it seems no more absurd or difficult of conception than the author's hyphenated Military-Industrial Organization of the Navy.

In thus venturing to join a "sporadic outbreak of criticism against the existing order of things," I am happy in the thought that the author regards me as not wholly un-American and perhaps "broadly human." I would not be accused of the "quiescent contentment" that is the antithesis of progress and efficiency.

JAPAN'S LATEST BATTLESHIP
The 30,000 ton Nagato, completed in 1920, is the most powerful ship afloat

PROFESSIONAL NOTES

Prepared by LIEUTENANT C. C. GILL, U. S. Navy

GENERAL ARRANGEMENT

PAGE

NAVAL POWERS:

*Argentine 1176
*Austria 1176
*Brazil 1177
*Chile 1177
*China 1177
*Denmark 1179
*France 1179
*Germany 1182
*Great Britain 1185
*Greece 1201
*Italy 1203
*Japan 1204
*Norway 1207
Roumania 1207
*Russia 1208
*Spain 1208
*Sweden 1210
*Turkey 1210
*United States 1212

*Order of topics under each power { vessels building, battleships, cruisers, destroyers, submarines, auxiliaries, personnel, naval policy.

ORDNANCE AND GUNNERY:

Guns 1225
Explosives 1227
Projectiles 1227
Target Practice 1228
NAVIGATION 1236
ENGINEERING 1239
AVIATION 1243
The Development of Aviation in Germany 1249
RADIO 1251
CANALS 1253
MISCELLANEOUS 1254
CURRENT NAVAL AND PROFESSIONAL PAPERS 1263

NAVAL POWERS

ARGENTINE REPUBLIC

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Rivadavia.....	27,940	22.5	12 12-in., 12 6-in., 16 4-in.	Fore River Co.	Under trials
Moreno.....	27,940	22.5	same	New York Co.	Trials Aug. 1, 1914

NOTE.—Argentine has four destroyers, displacement 950 tons, contracted for (two built at Nantes and two at Bordeaux), launched in 1911 but not yet turned over to the government. Also four additional destroyers of about 950 tons to replace those sold to Greece, building at Krupp's Germania Works.

The New York Shipbuilding Co., proposes to send the Argentine battleship *Moreno* on her official trial trips in August. Most of her guns have been placed in position.—*Shipping Illustrated.*

AUSTRIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Prinz Eugen..	20,010	20	12 12-in., 12 5.9-in., 18 12-pdr.	Trieste	Trial Mar. and Apr. 1914
Szent Istvan..	20,010	20	same	Fiume	Launched Jan. 17, 1914
Ersatz Mon'ch	24,500	22½	10 14-in.	Trieste	To be laid down, 1914
" Budapest	24,500	22½	same	"	" " " " 1914
" Wien....	24,500	22½	same	Fiume	" " " " 1914
" Hapsburg	24,500	22½	same	Trieste	" " " " 1915
Small Cruisers					
Saida.....	3,454	27	9 4.1-in.: 2 6-pdrs.	Monfalcone	Trials Apr. 1914
Helgoland	3,454	27	same	Fiume	Launched Nov. 23, 1912
Novara.....	3,454	27	same	"	" Feb. 15, 1913

NOTE.—Three destroyers launched in 1913, displacement 787 tons, nearing completion. Two submarines, displacement 550 tons, and three of 860 tons, contracted for in 1912 are to be built by Krupp Co. There are also 27 torpedo boats of 250 tons displacement in various stages of construction.

As at present arranged the new Austrian dreadnoughts will be laid down as follows: One in August, one in October, and the other two in the spring of next year. It is calculated that the Austrian yards can build a battleship in 30 months. This may be true of the Stabilimento Tecnico and of the Monfalcone concern, but whether the Danubius Yard—which is subsidised by the Hungarian Government—is yet sufficiently complete to do so is another matter. The establishment of a fully equipped dockyard is a lengthy affair, and the fourth of the present Austrian dreadnoughts, *Svent Istfan,* is considerably behind time.—*The Engineer.*

EXTRAORDINARY ACTIVITY REPORTED ON SERVIAN FRONTIER.—Paris, July 7.—The *Temps* prints a despatch from its correspondent at Belgrade, Servia, which says that extraordinary military activity is evident on the part of Austria. Forty carloads of artillery, the despatch continues, are known to have left Budapest for the frontier.

Similar activity, acording to the despatch, is evident all along the Austrian border of Servia.

BRAZIL.

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleship					
Rio de Janeiro	28,000 to 30,000	..	8 or 10 15-in.	Armstrong, Whitworth & Co.	Contracted for Feb., 1914

NOTE.—Three submarines, contracted for in 1912, to be built at Spezia, displacement 330 tons, were ready Aug. 1, 1913, and two have been turned over to the government.

The Brazilian Admiralty has decided on the construction of a dreadnought of 20,000 tons, and to carry 15-in. guns, to replace the *Rio de Janeiro*. It is further announced that a contract will be signed shortly by the Brazilian Minister of Marine and Armstrong, Whitworth & Co.—*Shipping Illustrated.*

CHILE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Almirante Latorre	28,000	23	10 14-in., 16 4.7-in.	Armstrong, Whitworth & Co.	Launched Nov. 27, 1913
Almirante Cochrane	28,000	23	same	"	Laid down Jan. 22, 1913

NOTE.—Of the 6 destroyers of 1830 tons, built by J. S. White & Co., two have been delivered. Two submarines of 420 tons displacement have been contracted for to be built by Elec. Boat Co., Seattle. One of these has been launched.

CHINA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Light cruisers					
Fei-Hung	2,600	22½	2 6-in., 4 4-in., 2 3-in., 6 3-pdr.	N. Y. Ship Bldg. Co.	Sold to Greece
.....	4,800	27	.....	Monfalcone	Ordered Nov., 1913
.....	1,800	24	.....	"	Contracted for Sept., 1913
.....	1,800	24	.....	"	same
.....	1,800	24	.....	"	same

NOTE.—Four destroyers, displacement 400 tons, are building, one at Trieste and three at Schichau. The three Schichau boats have been delivered.

THE CHINESE WAR FLEET.—There could be no greater or more striking example of the shifting and uncertain nature of the policy of the Chinese Government, during the last 50 years, than the wobbling manner in which the affairs of its navy have been conducted by those in authority, whether under the Dynasty or under the Republic. Millions of taels have been absolutely wasted in the giving and subsequent cancelling of orders to build warships, provide naval works and equip naval bases. All nations which build ships have had a taste of the yellow man's shiftiness and untrustworthiness in nearly everything that concerns his fleet of warships. At least half-a-dozen missions of British naval officers and petty officers have from time to time been sent to the Far East to lick the Chinese Navy into shape and set up some sort of honest and reliable administration. They have one and all, in the end, come home discomfited. When the Republic was formed it was hoped by the best friends of China that honesty and straightforwardness might prevail. There may be a gain in this direction, but uncertainty and wobbling still form a part of their policy in handling their naval affairs. The mission which was engaged has not started, the order for the best part of the last batch of warships has been cancelled, and the money is to be spent on merchant ships, and all is once again weakness and confusion in the Chinese Navy. Contracts are being kept, as the President of the Republic promised they should be, but at a great sacrifice to the Chinese public. In fact, China appears to have yet to learn that she cannot become a big world power, in present conditions, unless she possesses a war fleet commensurate with her sea interests. —*United Service Gazette.*

THE CHINESE SITUATION.—From a military point of view it is a matter for regret that the progress of affairs in China is not watched more closely by the general public in this country. Our fellow-subjects in the oversea dominions, particularly in Australia and New Zealand, are at the present moment intensely interested, not to say excited, over the trend of affairs in the Chinese capital, where that clever statesman, Yuan Shih Kai, is again master of the situation. As is well known, considerable financial power is centered in and around the Chinese capitals, and the continued unrest which has existed, and still exists, and which is due to the antagonisms of the rivals for government, and especially between the supporters of the dynasty and the followers of the Sun Yat Sen school, has brought about a situation that is full of peril, and that will sooner or later lead to an upheaval that European powers cannot afford to ignore. What concerns our oversea compatriots most, apart from the question of British prestige in the Far East, is to know exactly what responsibilities they will have to shoulder should international complications arise out of the present unrest, and whether, and in what measure, the mother country would step in at the crucial moment. It is hoped that the Imperial Defence Committee are giving the matter their close consideration, particularly as the present reorganisation of Chinese rule will apparently leave Yuan Shih Kai in complete control. It is evident that he is proceeding very cautiously in re-establishing his influence, and contriving in such a way as to secure that the populace will not support the moderates of the Young China party, whose ideas are, in our opinion, more likely to lead to a pacific issue than those which are encouraged by Yuan Shih Kai. As we have said, the position is full of peril, and Yuan Shih Kai is playing a deep and dangerous game—*United Service Gazette.*

CHINA AND THE SEA.—Although the political troubles in the Chinese Empire have for the time interfered with the placing of orders for new ships of war, and the proposal to obtain a naval mission from this country has been deferred, the Chinese Government is persisting in training personnel. It has naval schools in existence now at Chefoo, Nanking, Foochow, Canton, and Woosung. The most notable of these institutions

is the naval college at Chefoo. The building, spacious, well-equipped, and possessing ample grounds, lies about 1½ miles to the east of the foreign quarter of Chefoo. Students of 12 to 16 years of age are admitted, and the whole course of training is free. A superintendent is in charge, and in addition there are assistants, inspectors, and teachers, numbering 16 persons in all. Provision is made for 192 students or cadets. The college curriculum includes English, geography, mathematics, sailing, rifle and gun practices, astronomy, and sundry other subjects. The China Year-book for 1913 includes in the list of the Chinese Navy the training cruiser *Shaoho*, of 2200 tons displacement, built in 1911 by Vickers, carrying a complement of 230; as well as the composite training-ship *Kingching*, built at Foochow in 1884, of 1905 tons displacement, carrying a complement of 202. There is also the steel training-ship *Tungchi*, 1000 tons, built at Foochow Arsenal in 1804, complement 155. Not only is the Chinese Government training officers for the new navy which is to be created as soon as the political conditions in the Empire permit, but the students include young officers who are to be drafted into the mercantile marine. Potentially China is one of the richest countries in the world, and the new government is evidently convinced that, once political conditions become stable, a great future lies before China on the seas.—*Naval and Military Record.*

DENMARK

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Niels Juel.....	3,675	16	2 9.4-in., 4 5.9-in.	Copenhagen	Laid down Sept., 1913

NOTE.—Three destroyers are under construction at Copenhagen and three submarines, displacement 200 tons, are being built by Whitehead Co.

FRANCE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
France.....	23,092	20	12 12-in., 22 5.5-in.	St. Nazaire	Trials April, 1914
Paris.....	23,092	20	same	La Seyne	" Mar. 15, 1914
Bretagne.....	23,172	20	10 13.4-in., 22 5.5-in.	Brest	Launched April 21, 1913
Provence.....	23,172	20	same	Lorient	" April 20, 1913
Lorraine.....	23,600	20	same	St. Nazaire	" Sept. 30, 1913
Languedoc....	24,828	21.5	12 13.4-in., 24 5.5-in.	La Seyne	Laid down April 28, 1913
Normandie....	24,828	21.5	same	St. Nazaire	" July 5, 1913
Flandre.....	24,828	21.5	same	Brest	" Oct. 10, 1913
Gascogne.....	24,828	21.5	same	Lorient	" Oct. 1, 1913
Bearn.....	24,828	21.5	same	La Seyne	Contract Jan. 7, 1914

NOTE.—There are approximately six destroyers and 23 submarines under construction.

THE NAVAL MANEUVERS.—The first phase of the maneuvers has proved eventful and rich in useful lessons. On hearing that the enemy "B" (*Patries* and *Suffrens*) had entered the Mediterranean en route for either Toulon or Bizerta, Read Admiral Lacaze, chief of "A" (*Bart-Dantons*), based on Ajaccio, put to sea to try and find him—a strategic task by no means easy, considering his meager scouting resources, which only comprised three armored cruisers and the seaplane ship *Foudre*, with two flying machines, besides destroyers. Yet this he managed to do owing to the skilful dispositions he adopted from the start, and especially to the superior speed of his battleships, which did fine steaming, and also to the good work of the seaplanes. After an encounter between armored cruiser divisions, in which he "lost" a few cruisers, he compelled "B" to accept, off the Algerian coast, an unequal fight, which, commenced in the evening with the gun, was pursued during the night with the torpedo. The two parties are held to have "suffered" very heavily. Meanwhile, Toulon and Bizerta prepared for eventual attack, sending to sea groups of destroyers, torpedo-boats, and submarines. But the best patrolling work was done by seaplanes, which, favored with fine weather, carried out long-distance scouting, the results of their observations being transmitted to headquarters by means of pigeons. Six seaplanes were mobilized at Toulon and four at Bizerta.

The lessons of the maneuvers in what concerns the utilization of speed and the speed endurance of the fleet under war conditions have been slightly disappointing. No doubt the faster fleet was shown to have on its side valuable strategic assets and to be also in a position of vantage in the tactical field, but, on the other hand, the steaming performances of the "armée navale," in the course of the 3-week exercises, though on the whole satisfactory, did not quite come up to expectations. The Première Escadre (*Dantons* and *Courbets*), good for 19.5 knots on paper, had to be satisfied, most of the time, with rates of 12 and 15 knots, to avoid motor defects in the *Mirabeau* and other ships, which is hardly creditable to these so-called dreadnoughts, and deprived the strategic operations of much of their interest. Poor quality of fuel and exaggerated coal consumption, when going at high speed, had also something to do with these poor achievements of the *Dantons*, which were similarly unlucky in last year's maneuvers and do not compare well for continuous sea speed with their nominally slower predecessors of the *Patrie* type, and with the cruisers of the *Gambetta-Quinet* series. But the worst troubles were experienced in the 12,000-ton *Suffren-Gaulois*, which suffer both from age and neglect, having had too long-carried insufficient crews. Robust and efficiently managed motors, together with the right sort of fuel, were seen to be the right elements of speed; a lesson not likely to be lost on the Rue Royale authorities. The destroyers proved essentially fair-weather craft. As usual, 330- and 430-ton boats, with reciprocating engines, proved more reliable than their newer and larger sister vessels. As to the 400-550-ton submersibles, good for 10-11 knots in a smooth sea, their lack of freeboard, inherent to the type, and the wrong position of their forward rudders, caused them to slacken down to 4 and 5 knots in choppy waters.

The first phases of the maneuvers, though perhaps not quite so realistic as had been expected, have proved, on the whole, a demonstration of the endurance of the materiel as well as of the value of the command and training, while confirming last year's lessons as to the urgent need of scouts and of more numerous destroyer flotillas, and as to the danger of incorporating in the battle fleet slow and obsolete pre-dreadnoughts that hamper its movements without adding materially to its strength; thus an ensemble of useful data which will guide the Conseil Superieur in the elaboration of next year's program. The possibilities of seaplanes, at least in fine weather, the importance of efficient mining in blockading operations, and also of coal and oil tenders to accompany or meet the fleet at sea, were other points on which interesting light was thrown.

The question of the best place for the admiralissimo in action has been the object of an interesting discussion in the Conseil Superieur. Two opposite views prevailed. A fast armored cruiser was held by a few admirals to be the ideal fleet flagship, as its superior mobility was best calculated to enable the commander-in-chief to follow the progress of the fight all along the line and direct the efforts of his squadrons. The duty of the admiralissimo, it was contended, is to see and order, and not to fight personally in the line. Arguments of this kind, it will be remembered, caused the unlucky Admiral Persano to shift his flag to the armored frigate *Affondatore* on the eve of Lissa. Suffren also removed his flag to the frigate *Cléopatre*, in the last of his stubborn contests with the brave Admiral Hughes, but this was through no choice of his, being the direct result of the emotion caused in France by the capture of the Count de Grasse in the Ville de Paris (1782). The majority of the Council, however, judiciously decided that the maneuver and example of his ship was for the commander-in-chief the most effective way of exercising his influence, signalling becoming impracticable once the action is engaged, and that consequently his flag must be hoisted in the strongest class of ships. The merit of the newly-formed "section amirale" (*Courbet*, fleet-flagship *Bart* and scout *de la Gravière*) is, in the words of Minister Gauthier, "d'être assez forte pour faire sentir sa présence, quel que soit le point de la ligne de bataille où se produise son intervention."

The experience of the last few years with active sea training, and especially the realistic study of strategy and tactics, has convinced naval opinion that the professional value of the command, which is of course the main factor of victory, as well as the efficient formation of commanders ever ready to assume the heaviest responsibilities, depend in a great measure on the degree of initiative which the commander-in-chief allows to subordinate flag officers and captains. Fleet efficiency, being made up of the combined efficiency of every individual squadron and ship, is best attained by giving the commanders of these units ample opportunity to devote their undisturbed attention to the force directly under their orders, so as to thoroughly acquaint themselves with the capabilities of the "instrument de combat" they would have to handle in action. Hence the general satisfaction at the reorganization of the battle fleet, which, by specializing the admiralissimo in the preparation of war plans and the supervision of periodical maneuvers and exercises, will have the effect of conferring on the squadron and division commanders a freedom of movement such as they have seldom enjoyed up to the present, and from which the best results are expected. The practice of the late Admiral Germinet to send his ships to train independently for weeks, far from the paralyzing presence of the flagship, is to be revived. A similar departure is being made in what concerns the flotillas formerly under a single captain "chef de division," and now divided into two independent commands, one comprising 36 destroyers and the other 16 submersibles and four destroyers. A new era of progressive training is thus opening for the Toulon fleet. —*Naval and Military Record.*

FRENCH SUBMARINE IN CRASH.—Toulon, July 7.—The submarine *Calypso* collided with the destroyer *Mousqueton* during the maneuver off St. Tropez to-day and sank immediately.

The *Calypso* lies in deep water and there is little hope that she can be saved.

Three members of the crew of the French submarine *Calypso* perished when the craft sank.—*New York Sun.*

"MAGON."—The French destroyer *Magon*, of 851 tons, whose trials were postponed so that several alterations might be carried out in her, has under-

gone a full power trial, and the success of the alterations has been shown by the fact that she made 33 knots as against the 30 knots she was designed for. She was built at the Chantiers de Bretagne (Nantes), and has Du Temple boilers, with oil fuel.—*The Engineer.*

SEAPLANES FOR FRANCE.—Inspired no doubt partly by the example of Britain, France has decided to form a flotilla of seaplanes to co-operate with the navy. This flotilla, placed under the orders of Admiral Boue de Lapeyrere, commanding the fleets of France in the Mediterranean, will take part in ordinary training with battleships and cruisers.

This is the first time the French naval authorities have apparently recognized the fighting value of seaplanes. Hitherto they have not been regarded as possible engines of war. The use made of the new arm will be followed with keen interest in service circles.—*Naval and Military Record.*

GERMANY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Grosser Kurfürst	26,575	23	10 12-in., 14 5.9-in., 12 3.4-in.	Hamburg	Launched May 5, 1913
Markgraf	26,575	23	same	Bremen	" June 4, 1913
König	26,575	23	same	Wilhelmshaven	" Mar. 1, 1913
Kronprinz	26,575	23	same	Germania	Launched Feb. 21, 1914
Ersatz Worth	29,000	....	8 15-in., 16 5.9-in.	Kiel	Laid down Sept., 1913
"T" 1913	29,000	....	same	"	Laid down May, 1913
Ersatz Friedrich III	30,000	....	8 15-in., 18 5.9-in.	....	To be laid down summer 1914
Cruisers of the Line					
Lützow	28,000	28.5	8 12-in., 14 6-in.	Dantzig	Launched Nov. 29, 1913
Derfflinger	26,500	28.5	same	Hamburg (Blohm & Voss)	Launched July 1, 1913
Ersatz Hertha	28,000	28.5	8 12-in.	Wilhelmshaven	Laid down July, 1913
Ersatz Victoria Louise	....	....	....	....	To be laid down summer 1914
Protected Cruisers					
Karlsruhe	4,900	28	12 4.1-in., 2 t. t.	Germania	Commissioned
Rostock	4,900	28	same	Howaldt	Commissioned
Regensburg	4,900	27.5	12 4.1-in.	Bremen	Launched Apr. 30, 1914
Graudenz	4,900	27.5	12 14.1-in.	Kiel	Launched Oct. 25, 1913
Ersatz Hela	5,500	27.5	10 6-in.	"	Laid down fall 1913
Ersatz Gefion	5,500	27.5	same	Stettin	" "
Ersatz Niobe	....	....	....	....	To be laid down summer 1914
Ersatz Gazelle	....	....	....	....	same

NOTE.—Germany has twelve destroyers and twelve or more submarines under construction. Tonnage of ships building uncertain.

The battleships *Kaiser* and *König Albert* which, together with the protected cruiser *Strassburg*, constitute the Detached Division, are now on their way home, and will arrive at Wilhelmshaven in the course of the month. They will then have accomplished a voyage of some 20,000 knots, which, as the *Marine Rundschau* points out, is a record distance to be traversed by turbine battleships within so short a time. At every port of

call in South America the ships appear to have had a most cordial reception. There is no doubt this cruise has done much to raise German prestige and promote German interests in that quarter of the world, and the bitterest disappointment will be felt if the sequel does not materialize in South American warship contracts for the home yards. It is believed that the entire cruise has been made without revealing any engine-room or other defects, though this is not surprising in view of the admittedly excellent workmanship that is put into all vessels built for the Imperial Navy. On their return the two battleships will resume duty with the third squadron, the *Strassburg* passing to the scouting group.

"ROSTOCK'S" SPEED TRIAL.—The small cruiser *Rostock* is reported to have reached in the trials a speed of 29.21 knots, which would make her one of the fastest vessels in the German Navy.

GERMAN SUBMARINES.—The number of submarines in the current German program is stated to be six, and all are understood to have been ordered. As regards the types of German submarines, a new class was begun with *U 21*, one of the vessels passed into service last year. This type has a length of 213 feet 8 inches, and a beam of 20 feet, which shows a considerable advance upon the early boats, which were 128 feet long, with a beam of 8 feet 10 inches. The number of completed German submarines being, according to the latest information, 27, there are presumably seven vessels in service of the new type. As regards the submarines building, there is further development to be noted. It is stated that the surface displacement has been increased to 900 tons, and that the speed on the surface will be 20 knots. The radius of action on the surface is given as 2000 knots. It is reported that two calibers of guns are mounted in each boat, one a 14-pounder on a disappearing mounting, and the other a 1-pounder on a fixed pedestal, experience having shown that it is possible to expose this gun to sea water without serious disadvantage. All this serves to remind us that in submarines of the most efficient type we are already in danger of losing our margin.

GERMAN AID TO RUSSIAN SHIPYARDS.—According to the service paper, *Heer und Politik*, the intimate relations which prevail between the Russian Putiloff shipbuilding yard and Messrs. Blohm and Voss, of Hamburg, are regarded with something like indignation in German naval circles. The great Hamburg firm, which has built most of the German battle-cruisers, and is one of the leading technical establishments in the country, recently undertook to reorganize and completely equip for naval shipbuilding purposes the Putiloff Yard at St. Petersburg, which has hitherto only constructed small vessels, besides armor plates, guns, projectiles, and torpedoes. The work is now finished, with the result that the biggest capital ships can be expeditiously built and equipped by Putiloff. Russian armament resources have thus received a most valuable asset, due entirely to the enterprise of the above-mentioned German firm. Commenting on the incident, *Heer und Politik* remarks that, however flattering to national sentiment the achievement of Blohm and Voss may be, grave doubts are entertained as to whether serious injury has not been done to German interests. No attentive observer of latter-day politics can fail to perceive the pronounced anti-German policy of Russia. In this connection it may be recalled that the Schichau Yard is now completing for the Russian Government two fast cruisers which are to represent the standard type for

future Russian cruisers; that the Vulkan Yard, at Stettin, prepared the plans and supplied the engines for the powerful Russian destroyer *Novik*, a type which is now being largely multiplied in Russian yards; and that other German establishments are actively engaged in constructing engines, torpedo-craft, etc., for the Russian Navy. All this activity is in progress at a moment when the German Press is printing alarming articles on the menacing dimensions of Russian armaments and speaking of war with that country as being practically inevitable. The situation borders on the Gilbertian, and it is very significant of German naval opinion that *Heer und Politik* should have made this strong protest against the German firm which has done so much to put Russian yards in a position to construct efficient ships of war.—*Naval and Military Record.*

NEW FLOATING DOCK.—The huge floating dock, with a lifting capacity of 40,000 tons, built by Blohm and Voss for the Imperial Dockyard at Wilhelmshaven, has been delivered, and is now in operation at the North Sea base. Before being towed to its destination it was subjected to an interesting test, the new liner *Vaterland*, the largest ship in the world, having been raised by the mammoth pontoon. The delivery of this dock will be welcomed at Wilhelmshaven, where there is a shortage of such accommodation for vessels of dreadnought dimensions. A floating dock of the same size has been in service at the Kiel State establishment for some time.

Two of the leading German yards, viz., Blohm and Voss and Schichau, are making, or are about to make, considerable extensions to their premises, and will eventually be in a much better position for building and repair work. The Schichau yard at Danzig is reported by *Schiffbau* to be contemplating the construction of a large graving dock on Holm Island, across the river, in addition to other improvements.

GERMAN NAVY LEAGUE DEMANDS.—The annual meeting of the German Navy League at Breslau on May 24 was graced by the presence of a royal prince and honored by many representatives of German naval administration. Admiral von Koester, who has been the moving spirit in this great organization for so many years, made it clear in his speech that the German Navy Law, with all its amendments, "must be carried out in the letter and in the spirit by 1920." The demands of the German Navy League as set forth in the Admiral's speech may be thus summarized: (1) Deficiencies of personnel to be made good; (2) reserve formations to be always ready and manned with crews at one-half war strength, and not as at present at one-quarter; (3) capital ship construction must be continued at three ships a year; (4) periods of construction to be reduced by six months. An interesting development of this scheme to watch will be whether the reduction of the period of construction by six months will in any degree injuriously affect the character of the ships. It had been thought that the construction periods, as at present arranged, provide for as short a time as possible, compatible with completeness and thoroughness in all details. To lop off half a year means an increase of speed in construction that will be carefully watched by Germany's rivals.—*Army and Navy Journal.*

GREAT BRITAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Benbow	25,000	22	10 13.5-in., 16 6-in.	Beardmore	Launched Nov. 12, 1913
Emperor of India	25,000	22	same	Vickers	" Nov. 27, 1913
Iron Duke	28,000	22	same	Portsmouth	Commissioned Mar., 1914
Marlborough	25,000	22	same	Devonport	Trials Mar. 1914
Q'n Eliz'b'h	27,500	25	8 15-in., 16 6-in.	Portsmouth	Launched Oct. 16, 1913
Warspite	27,500	25	same	Devonport	" Nov. 26, 1913
Valiant	27,500	25	same	Fairfield	" Dec., 1913
Malaya	27,500	25	same	Walker	Laid down Oct. 20, 1913
Barham	27,500	25	same	Brown & Co.	Launched Feb., 1914
Roy'l Sover'gn	25,500	21	same	Portsmouth	Laid down, Jan. 15, 1914
Royal Oak	25,500	21	same	Devonport	" Jan. 15, 1914
Resolution	25,500	21	same	Palmer	" Nov. 28, 1913
Ramillies	25,500	21	same	Beardmore	" Nov. 12, 1913
Revenge	25,500	21	same	Vickers	" Jan., 1914
Battle Cruisers					
Tiger	30,000	30	8 13.5-in., 12 6-in.	Brown & Co.	Launched Dec. 15, 1913
Light Cruisers					
Brisbane	5,400	25	9 6-in., 4 3-pdrs.	Sydney	Laid down Jan. 25, 1913
Birmingham	5,440	25.5	same	Elswick	Commissioned, Feb. 3, 1914
Lowestoft	5,440	25.5	same	Chatham	" Apr. 21, 1914
Nottingham	5,440	25.5	same	Pembroke	" Apr. 3, 1914
Aurora	3,600	30	2 6-in., 8 4-in.	Devonport	Launched Sept. 30, 1913
Arethusa	3,600	30	same	Chatham	" Oct. 25, 1913
Penelope	3,600	30	same	Barrow	Laid down Feb. 1, 1913
Phaeton	3,600	30	same	"	" March 12, 1913
Royalist	3,600	30	same	Dalmuir	" June 3, 1913
Galatea	3,600	30	same	"	" Jan. 9, 1913
Inconstant	3,600	30	same	"	" April 3, 1913
Undaunted	3,600	36	same	Govan	Launched April 28, 1914
Cleopatra	4,400	30	.....	Devonport	Laid down Feb. 26, 1914
Calliope	4,400	30	.....	Chatham	" Jan. 1, 1914
Conquest	4,400	30	.....	"	" Feb. 28, 1914
Cordelia	4,400	30	.....	Pembroke	Launched Feb. 23, 1914
Carysfort	4,400	30	.....	"	Laid down Feb. 25, 1914
Comus	4,400	30	.....	Wallsend	" Nov. 3, 1913
Caroline	4,400	30	.....	Birkenhead	" Jan. 28, 1914
Champion	4,400	30	.....	Hebburn	" Feb. 28, 1914

NOTE.—England has approximately 31 destroyers and 24 submarines under construction.

The battleship *Queen Elizabeth*, and her sister ships, *Warspite*, *Valiant*, *Barham*, and *Malaya* mark the commencement of a new era in British naval construction, being the first ships to carry the new 15-inch gun—a weapon which discharges a projectile of 1950 pounds weight against the 1400 pounds of the 14-inch and latest 13.5-inch guns. In addition, they will be the first ships other than scouts and torpedo craft to be driven solely by oil fuel, and with their speed of 25 knots—which is likely to be greatly exceeded on trial—will have the distinction of being the fastest battleships afloat.

Although officially designated "battleships," the *Queen Elizabeth* class are becoming looked upon as "battle-cruisers" from the fact that their speed is four knots in excess of the standard speed for line ships and obviously intended for overhauling the enemy's rear-guard and forcing an action—the generally accepted role of the battle-cruiser. In later ships a return has been made to the usual speed of 21 knots, the *Royal Sovereign*

class which are now under construction having the same armament as the *Queen Elizabeth*, but on something like 2000 tons less displacement—the decrease being accounted for by the drop in speed, and the saving in machinery weight, engine room, and therefore dimensions.

The adoption of the 15-inch gun is, of course, typical of the British policy, which is "superiority both in numbers and individual power." It would have been simpler to have met foreign ships armed with ten or more 14-inch guns by the construction of similar ships, but equality does not postulate annihilation, and this is what will probably be the fate of the *Queen Elizabeth's* opponents. British gunnery experts do not, however, favor the placing of more than ten big guns in a ship, and even had the Admiralty been anxious to retain the very successful 13.5-inch gun which has appeared in the *Orion, King George*, and *Iron Duke* types, their reply to, say the *Pennsylvania*, would have been a ship with ten of these pieces—12 or 14 such guns would have been more than can be adequately controlled, according to British practice. Eight guns being the ideal group, it becomes obvious that the only way out of the difficulty of providing a better and more powerfully armed ship lay in increasing the caliber of the guns—hence the advent of the 15-inch and the probable early reappearance of the 16.25-inch gun when the smaller weapon becomes generally adopted elsewhere.

In appearance the new ships will be very much like the *Iron Duke* class, with the amidships turret suppressed and an extra mast aft, instead of the stump between the funnels, which is such an unsightly feature of these vessels. There is the usual pile of chart houses and bridges forward, the heavy tripod mast with a double-storied control-top, big funnels, and torpedo net defence. The big guns are in four 14-inch turrets along the center line, the third and fourth superfiring axially. In casemates in the superstructures and along the upper deck are spaced the 16 6-inch rapid-fire guns, while eight 3-inch anti-aero guns are distributed over the upper works, and four more are carried at the stern of the ship. There are five torpedo tubes (21-inch), two on each side and one in the stern, all below water.

The dimensions of the *Queen Elizabeth* are: Length, 650 feet over all; beam, 94 feet, and draft, 27½ feet, giving a displacement of 27,500 tons.

For water-line protection there is a 13½-inch belt extending from the base of the foremost turret to just short of the aftermost, with 6-inch continuations to within about 20 feet of the extremities. Above is a 10-inch strake along the lower deck side amidships with 8-inch over the battery, the gun positions in the superstructures being similarly protected. Amidships the hull is covered with thin armor—two or three inches, probably—down to the keel, and a most elaborate system of internal under-water protection reinforces this. The thickness of the armor decks and bulkheads is uncertain.

The great speed has only been attained by the substitution of oil fuel for coal, and a supply of 4000 tons of this can be stored. With Parsons turbines generating 58,000 nominal horse-power and driving four screws, the designed speed is 25 knots.

Of the five ships, only the name ship and the *Warspite* have as yet been launched (March), and these two are due for completion in October; the remaining three should join the flag between spring and summer, 1915. At present afloat the only ships which can compare with them in fighting power are the *Texas* and *Oklahoma* classes, with the Japanese *Kongo*, the Chilian *Al. Latorre*, and the Turkish *Rechadieh*.—*Scientific American.*

NAMES FOR NEW BATTLESHIPS.—The names of the four new battleships of the 1914-15 program are to be: *Agincourt*, to be laid down at Portsmouth; *Resistance*, laid down at Devonport; *Repulse*, to be built by the Palmer Shipbuilding Company; *Renown*, to be built by Fairfield Company. *Agincourt* will be a *Queen Elizabeth*, the others of the *Royal Sovereign* class.—*The Engineer.*

H. M. S. "UNDAUNTED."—Light armored cruiser for the British Admiralty under the 1912-1913 naval program; 410 feet by 39 feet; 3500 tons displacement. The vessel is one of eight similar ships building under this program, and is the first to be launched from a private yard. They will form a new class, and will be armed almost as heavily as the first *Town* class, with protection equal to the later vessels of that class. The propelling machinery, of 30,000 S. H. P., consists of four independent turbines of the Brown-Curtis type, each driving its own propeller and arranged in two separate water-tight compartments, so that each pair of turbines forms a complete and independent propelling installation. There is an astern turbine incorporated with each of the ahead turbines in the same casing, so that all four propellers are available for going astern. Steam is supplied by eight Yarrow water-tube boilers, arranged in two water-tight compartments, and adapted for burning oil fuel only. The speed is expected to be about 30 knots. Launched, April 28.—*Shipbuilder.*

"MIRANDA."—H. M. S. *Miranda,* building by Messrs. Yarrow & Co., Ltd., of Glasgow, for the British Admiralty, was successfully launched at the firm's yard.

This vessel, one of the three special destroyers ordered from Messrs. Yarrow & Co., Ltd., of their own design, is 260 feet long by 25 feet 7 inches beam. The contract speed is 35 knots, and the vessel is fitted with Messrs. Yarrow's latest type of water-tube boilers and superheaters, by which a considerable economy in fuel is obtained.

It is interesting to note that H. M. S. *Miranda* is the first vessel to be launched of the 1913-1914 program known as the *M* class.

"LANDRAIL."—H. M. S. *Landrail,* the fourth torpedo-boat destroyer of the 1912-1913 program, built by Messrs. Yarrow & Co., Ltd., of Glasgow, was handed over to the British Admiralty on the 10th instant.

This vessel, which is 260 feet long and 27 feet 6 inches beam, is propelled by turbines, the steam being supplied by three of Messrs. Yarrow's latest type of water-tube boilers, fitted with feed heating and superheating arrangements, by which a considerable economy in fuel is obtained.

THE SUBMARINE MENACE.—Admiral Sir Percy Scott wrote to the *Times* of June 5 a letter under the above heading which has attracted general attention on both sides of the Atlantic. The main points in his letter were:

The introduction of vessels that swim under water has already done away with the utility of ships that swim on the top of the water.

As no man-of-war will dare to come within sight of a coast that is adequately protected by submarines, battleships can no longer:

Attack ships that come to bombard our ports.

Attack ships that come to blockade us.

Attack ships convoying a landing party.

Neither can they:

Bombard an enemy's ports.

Blockade an enemy.

Convoy a landing party.

As there will be no enemy's fleet to attack when it is unsafe for all fleets to put to sea, this function of the battleship will cease to exist.

If we go to war we shall have to lock our dreadnoughts up in some safe harbor, providing we can find one.

If by submarines we close egress from the North Sea and Mediterranean, it is difficult to see how our commerce can be much interfered with.

Not only is the open sea unsafe, but in narrow waters and harbors surface ships are at the mercy of the submersible torpedo carrier.

What we require is an enormous fleet of submarines, airships, and aeroplanes, and a few fast cruisers, provided we can find a place to keep them in safety during war time.

To the Editor of the *Army and Navy Gazette:*

SIR.—Admiral Sir Percy Scott is to be admired for launching forth his views that the battleships of the future are to be doomed in favor of auxiliary vessels, engines of destruction, the growing fancies of the moment.

But surely he would not advocate or favor such revolutionary changes until we had learnt something of real warfare under modern conditions.

It has often occurred in the past, and I should imagine that it will occur again in the future, that fleets will assemble to make demonstrations where opposing interests are involved, whilst diplomacy is working its best to stave off the horrors that will follow once the first shot is fired.

I cannot fancy that submarines and aerial craft would give much weight on occasions of that nature, even if they could be collected in their hundreds to make a bold show.

As an illustration of my meaning I happened to be serving in the Mediterranean fleet, when our good neighbor France had well established herself in Syria; diplomacy was doing its work, and succeeded eventually in persuading the French fleet to leave the anchorage off Beyrout. They left because our fleet went there to demonstrate, and . . . . if diplomacy had failed. Therefore, as these conditions are certain to arise in some form or other, on future occasion, and very likely at far greater distances than the coast of Syria, I do not think these auxiliary forces alone, in whatever numbers, would be of much use without a fleet of battleships and cruisers, either for the purpose of demonstration or enforcement of action.

June 9. V. A. MONTAGU, Rear Admiral.

To the Editor of the *Army and Navy Gazette:*

SIR.—The letter which Admiral Sir Percy Scott has addressed to you on the subject of the menace of the submarine, gives one furiously to think. The wonder is upon what basis or foundation he has raised his theory of the all-powerful invulnerable submarine, and why, having satisfied himself six months ago that the battleship had been rendered useless, he has delayed so long in sounding his note of alarm. He demands to be told of battleships, are they of use or are they not? But can this question be answered satisfactorily with regard to submarines? Can either question be answered definitely short of the supreme test of war? When and where has the submarine been submitted to actual trial by such a conflict as the battleship has come through successfully in our own time?

When Sir Percy Scott says that certain functions of a vessel of war cannot be performed by a battleship on a coast that is adequately protected by submarines, is he not begging the question? What number of submarines does he consider necessary for the adequate protection of such a coast as ours? It has been stated that it is possible to build eight or ten submarines for the cost of one battleship. It is proposed to lay down four battleships this year. Sir Percy would substitute for these forty submarines. But we should be told what extent of coastline these forty submarines will adequately protect. And after all, it is not its coast that this country has to protect any more than its commerce and its communications. It is not clear, from the description of the dangers to which our commerce will become liable under the new conditions, how Sir Percy expects these to be met. Indeed, from the concluding paragraph of his letter it might be supposed that he contemplates the possibility of these islands being absolutely deprived of all their supplies of food and raw material by the submarines of a hostile power. "Their submarines," he says, "will come over and destroy anything and everything they can get at."

Why, it may be asked, should submarines be less liable to destruction when the proper means for that object have been devised than any other vessels which have been used for making war? The admiral does not mention mines. These are a species of torpedo which will be towed, it is said, at varying depths by vessels adapted to that purpose. It seems possible that in their use, coupled with that of the aeroplane, will be found that antidote to the submarine afloat which is required. There is also, as

Sir Percy says himself, the possibility of bombs dropped from aircraft. Is it not possible so to defend a harbor with mines as well as booms that it will be impregnable to the submarine? We seem to know as yet very little about the possible phases of a modern naval war. Fiction writers, indeed, have found in the subject a fruitful theme, but authoritative information on the subject is lacking. Possibly, nay probably, the admiral knows much more than he cares to publish, but surely the people of this country should be enlightened on this matter.

All who are interested in shipping and in the secure transit of their goods by ocean routes have special occasion to consider these questions which Sir Percy Scott has so candidly dealt with. It it not only that if he is correct public money is being wasted, but if the threat of the submarine which he talks about is made good, what is to become of the enormously valuable commercial interests of this country which are from day to day upon the seas? For my own part, I cannot altogether believe that the dominion of the ocean can ever rest with an instrument which dare not come into the open, and which owes its own security to its being able to move for short periods under water. I was much struck by a passage which you quoted last week from an article in this month's *Blackwood* on the fire-ship by Mr. David Hannay:

Victory has never so far gone to those who fight by evasion, by concealment, by striking in the dark, by waiting for the unguarded moment—points they may score, but they have never won in the end.

June, 1914. MILES.

—*The Army and Navy Gazette.*

SUBMARINES IN THE FRENCH EXERCISES.—In the controversy which is inevitable after the publication of Sir Percy Scott's views, the results of the tests to which submarines were subjected in the French naval maneuvers recently completed are of considerable interest. Our Paris correspondent writes that many consider that the seaworthiness, efficiency, and growing capabilities displayed by the submarine flotillas, many consider, supply the most important lesson of the maneuvers, and demonstrate that the submarine will play a decisive rôle in the narrow European seas. Although such views might be exaggerated, it must be acknowledged that the 16 submersibles of the *Laubeuf* type (400-550 tons, 12-14 knots on the surface) attached to the battle fleet, which some considered at first a cumbrous and useless impediment, having only "moral value," have shown their aptitude to effectively co-operate with the battle squadrons, and give a good account of themselves, not only in sheltered waters off the coasts, but also on the high sea. They are estimated to have covered some 1600 miles in the course of the exercises without accident, spreading their dangerous chaplet across the probable route of an enemy, and everywhere making their presence felt. Led by the cruisers of Admiral Sénès, they "destroyed" part of the battle fleet in the mid-Mediterranean. The masterly way in which they were handled shows that the problem of their utilization has been well studied.—*Naval and Military Record.*

A NAVAL OFFICER'S VIEW.—"A Naval Officer," writing to *The Times*, says: I am sure that many naval officers will share my extreme surprise at the letter by Sir Percy Scott. This feeling is due, in the first place, to the conviction that a public newspaper is not the correct place for putting forward opinions, matured or otherwise, which are intended to assist the navy or any other department of the government by one who is or has been a servant of a department of the state.

Another reason for surprise is that an officer of the status of Sir Percy Scott should, as you express it, communicate a "thesis" resting on "premises which even on paper are very difficult to prove." Sir Percy Scott makes no attempt to prove these, and yet seems to think that his opinion, expressed with more of sensationalism than of convincing argu-

ment, should be accepted although it involves a complete volte face so far as the policy of every Admiralty in the world is concerned. The opinions expressed and the policy advocated should not therefore have attached to them even by the layman in this country, any serious importance. It would be most unfortunate, too, if those responsible for the naval policy of foreign powers should regard Sir Percy Scott's views as in any way reflecting the matured opinion of recognized naval authorities in this country.

No one will gainsay the great possibilities of the submarine boat, and it is for this reason that all powers are acting, as is the British Admiralty, in increasing in due proportion, relatively to other ships, the number of submarine boats available for offence and defence. But Sir Percy Scott goes far beyond the support of this view in stating that he can see "no use for battleships and very little chance of much employment for fast cruisers," and, further, "that the building of any more battleships now will be a misuse of money subscribed by the citizens for the defence of the empire." It will be amazing if anyone accepts this unreasoned statement against the matured policy not only the Board of Admiralty and the War College, but also of the Committee of Defence and of the decision of the Admiralties of all naval powers.

The French Admiralty some time ago, believing that they had the ideal submarine boat, seriously considered adopting the policy which Sir Percy Scott now suggests. The result was complete confusion, the displacement of France as a high naval power, and the reversion to the policy of building battleships and cruisers as well as small craft in great haste in order to recover the position lost.

Sir Percy Scott makes some statements which do not bear out his general contention. He contends that "a battleship is not immune from attack even in a closed harbor, for the so-called protecting boom at the entrance can easily be 'blown up.'" No submarine boat has yet attacked a boom with success. Destroyers have done so, not by breaking up the boom, but by "jumping" it, and the vessels afterwards have been of little service owing to the damage sustained. The new explosive booms which have been tried with great success in several continental countries, and which may be relied upon to defeat the attack even by destroyers, will prove an important addition to the present type of boom defence, so that the argument that battleships will not live through the preliminary action confined to submarine boats can be rejected with confidence. No doubt at the commencement of hostilities the engagements for several days will be between the "mosquito" type of ships, such as submarine boats and destroyers, with aeroplanes and seaplanes for locating the opponents, but there is nothing in experience to show that the final issue will not ultimately depend on ships of the line, as of old.

The argument that a battleship cannot outlive submarine attack depends entirely upon the efficiency of the torpedo used almost as the exclusive weapon of the submarine boat. No doubt great advances have been made not only in the range, but in the accuracy of the modern torpedo, but the results of torpedo attack in the Battle of the Sea of Japan were disappointing.

There is another point which must not be lost sight of. The maximum speed of the submarine boat at the present time is approximately 14 knots, as against the 22 knots of the battleship, the 28 knots of the cruiser, and the 30 knots of the light armored cruiser. Can it be seriously considered that the submarine boat would be able to outrun the heavier and heavier armored ships of the fleet? In the quite probable event of a submarine flotilla failing to bottle up an opposing fleet in its habor, and the enemy's fleet getting to sea without our having any surface boats to oppose them, the fate of our food supplies would be beyond doubt, and the whole fabric of Sir Percy Scott's exclusively submarine fleet would be of little avail.

Thus, while on no account seeking to underrate the value of the sub-

marine boat and the aeroplane and seaplane or the gallantry and patriotism of the officers and crews manning them, it must be confessed that Sir Percy Scott has failed entirely to establish his case in favor of dispensing with battleships. Surely he himself cannot believe that the thinking public will agree to the British Empire, including the dominions beyond the seas, being dependent exclusively for defence upon submarine craft while other nations are steadily building not only submarine boats, but every other unit of the fleet.—*Naval and Military Record.*

A NAVAL ARCHITECT'S SUGGESTION.—The subject of battleships versus submarines was discussed by the Institute of Naval Architects at Newcastle-on-Tyne, England, July 8. Prof. Sir John Biles remarked that to some it might seem that the readiest way of protecting battleships against submarines was to clothe the bottoms with armor. The only considerable effect would be to reduce the speed two knots. It was for the naval officers to decide whether the gain in protection was worth the loss in speed.*

A NEW TYPE OF BATTLESHIP.—Many prophecies made by the big-ship enthusiasts when the dreadnought was born, back in 1905-6, remain unfulfilled to-day, and the naval position which this name-ship was to ease is as acute as ever, although the names of over a score of this type are to be found in the British Navy list alone. The inspiration for this class of all-big-gun ship came from the late brilliant naval constructor, General Cuniberti—whose death was a loss to the world as well as Italy—but the type was brought into being by the British Board of Admiralty. Not many months before his death, General Cuniberti, in one of the marine publications of Italy, the *Rivista Maritima*, sketched another vessel of the future, which may best be described, perhaps, as a torpedo battleship. Like the dreadnought suggestion, this idea has been lying dormant for some time, but it looks as if it may shortly be taken up and find realised expression in the first fighting line of one of the world's navies—not unlikely in the same fleet as set the dreadnought fashion. That, at least, is the belief of not a few experts in this country.

The birth of a torpedo battleship stands to be hastened by the fact that the French are perfecting a Whitehead torpedo, which is reputed to run with high speed and great accuracy, up to a fighting range of 9000 yards. If this is true, then the Whitehead torpedo will not in future be debarred from taking part in an action until the battle squadrons close to a shorter distance than they can at present open fire on each other. We have probably already arrived at the limit of range at which a sea action will open, in having guns that will carry with great penetrating power and accuracy to a distance of from 8000 to 10,000 yards. The limit at which a turret gunlayer could see a target, at a height of about 30 feet from the waterline, is the practical limit at which an action can be fought, since the control officer at the masthead, although he may be able to see further, is subject to be dethroned by one of the first shots from the enemy. This was indicated when the "spotters" position on board the *Hero* was destroyed by one of the first shots in the gunnery experiments that sent that ancient battleship to the bottom. The extreme range at which a ship is large enough for a target for a man 30 feet above the water-line is about 12,000 yards, and the practical fighting range may, perhaps, be set at a limit of 10,000 yards, receding to 8000 yards. As considerations at present prevent a turret gun being carried higher than about 30 feet from the water-line, and as admirals and captains are not likely to waste shots by opening fire before the enemy is sufficiently above the horizon to offer them a good target, 8000 to 10,000 yards may be taken to represent the practical maximum at which a sea action will commence to-day.

---

* See reference to current publications, page 1265.

And what is the rule of to-day is likely to remain the rule of to-morrow, since the shape of the world is not likely to alter so as to make an object visible at sea to a gunlayer at a greater distance than 12,000 yards on a clear day, when he is about 30 feet above the sea floor. Even the 12,000-yard maximum will only be obtainable on a clear day, and more often than not this will be reduced to 8000 or less by the haze and mist so often to be found, all the year round, in northern latitudes, which, of course, includes the North Sea. So even if turrets were carried higher, and control apparatus given greater security, the limit at which a sea action can be opened is permanently controlled by the state of the atmosphere and the shape of the world—two permanent factors to be remembered by the men who build and the men who fight battleships. These factors give a torpedo battleship carrying mobile weapons, with an acurate range and speedy pace up to 9000 yards, a place in the battle line at the opening of an action at present-day practical ranges. The vessel sketched by General Cuniberti is a vessel just over 400 feet long, nearly 65 feet broad, with engines of 30,000 horse-power, to drive her 25 knots.

The vessel would be driven by the Diesel internal combustion engines and we should thus get the long-talked-of motor battleship. Forward and aft is a turret covered with armor 15¾ inches thick. These armored shafts shelter all the controlling instruments for torpedo fire, etc., and they are the chimneys or shafts which ventilate the ship, for the hull is almost entirely submerged so as to offer a very small target to the enemy. Cuniberti's suggested torpedo battleship is also thickly armored at the water-line, the armor tapering away to the bottom of the ship, which has a singularly flat floor, and is therefore of comparatively light draft. There are six torpedo tubes forward, six amidship and six aft, with the necessary motors, etc., and the broadside consists of nine fixed tubes, whose direction would be brought on by the helm of the ship. This is a formidable broadside from a vessel with such high speed, low hull and thick protection. She would have many of the advantages both of a submarine and a surface craft and also some disadvantages, one of which would be, that being so low, she could not readily be maneuvered in bad weather. Still, a ship or a fleet would have a lot to fear from her, when such a small target was creeping around in the darkness or foggy weather; she would also have slippery heels, even in rough weather, when compared with other torpedo craft. In addition, and most important of all, she would not have to run across a danger zone before she could open fire on her enemies, but would be able to use her weapons from the limit of the practical fighting range of to-day and hit back as soon as she could be hit. This is the supreme quality that may find a torpedo battleship a place in the British, or a foreign navy at an early date after the advent of the 9000-yard range Whitehead torpedo.—*United Service Gazette.*

SUBMARINE "G 1."—According to the *Zeitung am Mittag*, the British submarine *G 1* has a displacement submerged of 1500 tons. Its oil motors develop 6500 horse-power, giving a speed on the surface of 24 knots, while the electro motors for submerged cruising are capable of 2400 horse-power, and are estimated to give a speed of 18 knots. This would constitute a record, the highest speed yet attained below the surface being the 15.6 knots of the French boat *Archimede*. The endurance of *G 1* on the surface is 2800 knots; submerged it is 900 knots. The exposed portion of the hull is plated with armor sufficiently thick to resist 6-inch shot at maximum torpedo range. As armament the boat carries eight 21-inch tubes and two 4-inch guns on disappearing mountings. The tubes are arranged in two groups at bow and stern respectively. Needless to say, the equipment includes all the latest improvements, such as wireless telegraphy and telephony. The complement comprises three officers, two engineers, a surgeon, and 46 men, yet in spite of this large number all on board are provided with most comfortable accommodation. Double cabins are pro-

vided for the officers, the men have beds instead of hammocks, and there is an electric cooking range for preparing hot food. Each member of the crew is provided with a safety helmet, electric torch, a thermometer, a Morse alphabet, and a hammer for giving sound signals. There is every reason to believe the description of this vessel is in harmony with the new experimental vessels now building for the British Admiralty at Barrow. She is approaching the time when her launch may be expected, but it is still impossible to get any particulars about her. All that is known is that she represents a very great advance on any submarine yet designed or constructed.—*Shipping Illustrated.*

BRITISH ROYAL CORPS OF NAVAL CONSTRUCTORS (QUALIFICATIONS FOR).—Under the new regulations about one-half to two-thirds of the vacancies in the British Royal Corps of Naval Constructors will be filled by selection from shipwright apprentices in the Royal Dockyards, and the remainder by candidates outside the public service who possess the necessary qualifications. No candidate will be admitted who does not give evidence of adequate technical education, and of having been engaged in practical shipbuilding work for a period of not less than a year and a half.—*Shipping Illustrated.*

TRAINING QUARTER-DECK OFFICERS.—Although the process of democratising the quarter-deck personnel of our war fleet is proceeding slowly, yet there are signs that preparation is being made to enable the authorities to quicken the pace at will. Whether by accident or design the Lords of the Admiralty have provided a recruiting ground for quarter-deck talent which the British Navy has never possessed to the same degree before, throughout its long history, although efficiency has been its watchword from the day of its foundation. These recruiting grounds contain the elements of which engine-room officers as well as executive officers are made, and they are broadening and getting more prolific year by year.

Ever since the first serious educational legislation of forty years ago started to leaven the masses of the country, the navy began to get fit material to be moulded for its manning needs, on the quarter-deck as well as on the lower deck. Strange to say, the navy's necessities first forced it to take advantage of this altered condition of affairs among the poorer sons of the nation, by compelling arrangements to man its engine-rooms more fully with mechanics trained by naval men in naval establishments, and Sir John Fisher introduced the boy-artificer source of supplying engine-room mechanics.

The boy-artificer scheme, owing, be it said, largely to the loyalty and the splendid instruction given by men themselves, trained as engine-room mechanics ashore, speedily became a success in almost every sense of that word, and to-day the British Navy has a set of engine-room mechanics second to no country in the world. The boys are taken between 15 and 16 years of age and trained by such an up-to-date, practical and theoretical curriculum, that at the end of four years training, they only need to be finished off with a period of experience in seagoing ships to make them ideal naval mechanics. They are good at handcrafts (for the inefficients are ruthlessly plucked at the training establishments), have a good headfull knowledge of the theory of engineering, all-sufficient for their purpose, and meantime they have been bent and moulded to naval conditions by their officers and instructors, while still young, as potters mould clay. What more ideal men could be needed for our engine-room workshops; what better material from which to recruit many future commissioned officers for the engine-room platform? The recruiting ground is close at hand, and the recruits are of exactly the right sort with which to democratise the navy as rapidly as is proper and judicious, whenever authority cares to take that matter in hand. The process has really begun already, and the step-out pace can be ordered at convenience.

A similar field is being prepared for recruiting executive officers for the quarter-deck and wardroom. It has been started, in its organized form, since the engine-room field was first laid down on systematic lines, and one can scarcely reject the conclusion that the possibilities and national usefulness of that scheme, having been at last realized, the authorities deliberately set to work to do for the executive line what it had already begun for the engine-room, and lay down a seed bed for the production of plants that could easily be transplanted from the lower deck to the quarter-deck. This can be done if emergencies arise, or when it might be politic, for appeasing agitations, to recruit a number of quarter-deck executive officers from the rank and file of the fleetmen.

The first step was to select the best boys in each class as they passed through their courses of instruction in the training establishments and take care that they received special instruction over and above their fellows, so they would have every chance to become petty officers while they were still young. This plan was started several years ago. Dozens of these lads have obtained warrant rank at an early age by reason of this special instruction and encouragement, and several are now qualifying for mate. The effect of providing for recruiting for the quarter-deck from the lower deck was thus speedy and direct. The system has gradually developed, and at each development the field for recruiting grows larger and the material for adding democratic leaven to the wardroom becomes more ample and suitable. The latest step, though we cannot believe it will be the last, consists in encouraging the more accomplished and ambitious youths to prepare themselves for the purpose set out above, by rating them ordinary seamen at the age of 17½ instead of the time-immemorial age of 18. They may be rated even earlier than this if they are specially deserving, on leaving the training establishments. These ambitious boys have every opportunity to get a real grip of their life's business at an early age, by special facilities provided for them, at all the early stages of their career, and it needs no abnormal imagination to see what possibilities there are in such a system for democratising the executive branch of naval officers, in due time and quantity.—*United Service Gazette.*

COMPOSITION OF THE 1917 FLEET.—The dreadnought strength of the British Empire, including the three ships built at the cost of the *Dominions* and *Malaya,* will, in 1917, be constituted as follows, the ships being arranged first with regard to speed and second with regard to broadside fire:

I. 21-knot ships:			
8 12-inch guns:	Total number	7	30
10 12-inch guns:	Total number	3	
10 13.5-inch guns:	Total number	12	
8 15-inch guns:	Total number	8	
II. 25-knot ships:			
8 12-inch guns:	Total number	6	12
8 15-inch guns:	Total number	6	
III. 28-knot ships:			
8 13.5-inch guns:	Total number	4	4

From this summary the difficulty of organizing the battle fleet on an eight-ship basis will be apparent, and it will be necessary either to depart temporarily from the principle which has held good since the formation of the Home fleet, or else to combine in one squadron ships which are not tactically suited to each other—that is, vesesls of different speeds, or whose primary guns are of different calibers. With three battle squadrons only this difficulty could be overcome by omitting from the general organization two ships of the early dreadnought type and four *Orions,* but that method is hardly likely to find favor because of the undesirability of

passing into the reserve newer and better ships than those in full commission. It will be seen that the above summary gives us a total of 46 completed ships in 1917, all save one of which will be at the direct and permanent disposal of the Admiralty. Eight battleships, additional, presumably to the second battle-cruiser squadron, are to be in the Mediterranean; and as we shall probably have no pre-dreadnought battleships in full commission in three years hence, this will leave us with 33 ships of the dreadnought type available for service in Northern Europe and elsewhere. As it is officially estimated that Germany will have 28 completed dreadnoughts in 1917, it is difficult to see how the Admiralty will maintain the 50 per cent superiority in home waters which they have declared to be necessary. —*Naval and Military Record.*

A STRIKING COMPARISON.—A stranger landing on this planet from Mars might imagine from indications in Germany and in the United Kingdom that the former lived on and by the sea, and was dependent upon a vast navy, and that the latter was a continental power in the enjoyment of security which the greatest military machine ashore can give. British ministers and others talk airily about our naval supremacy, but no one would imagine from the public press that that supremacy was steadily shrinking. It is as though neither governed nor those who govern cared what happened to the naval power upon which our all depends. How different is the scene in the German Empire and particularly in Prussia. There the expansion of the fleet is progressing methodically from year to year in accordance with an elastic standard. Periodically the standard is raised, and all the time there is a keen and enthusiastic movement in favor of fleet increase. If the present indifference to naval power continues in this country, the sun of the British Empire will set. If disaster is to be averted by some means or other, the people of the British Empire must be roused to the fact that their heritage is slipping from them. This is not merely a matter of dreadnoughts or of ships of other classes or of personnel but it is a matter of atmosphere. Germany is becoming deeply impregnated with a sense of the primary importance of sea power, while on this side of the North Sea there are marked indications of an increasing want of appreciation of all that the fleet means to us. In this country the First Lord of the Admiralty is competing with the Chancellor of the Exchequer to win applause by promises of reducion in naval expenditure, and is talking of a "naval holiday"; in Germany, from the Imperial Throne downwards, effort is being put forth to prepare the public for increased naval expenditure. This is the contrast which these two nations present at this moment.—*Naval and Military Record.*

GERMANY'S ALLIES.—Turning our gaze on Italy and Austria-Hungary, Germany's two allies, we are confronted with a situation which is really far more serious than the crisis of 1909, and yet neither in press nor on platform is heard any reference to the peril which threatens our very existence. During the past winter the Navy League has made strenuous efforts to direct attention to the naval problem, but with only limited success. The outlook is now so grave that no single organization can cope with it. For the first time in our history we are face to face with the combined movement of three great powers to produce a combination of naval strength which shall far exceed the aggregate strength of the British fleet. Year by year the activity in these three allied countries is increasing. They are not only building ships, but they are providing increased personnel in order that every effective vessel may be kept in commission throughout the greater part of the year, if not, indeed, throughout the year. Italy has adopted a new program, which provides for the construction of four more large armored ships, besides other craft; Austria has just voted the money for the construction of a similar number of large armored ships and a number of cruisers and torpedo craft; Germany

is carrying out the amended Navy Law of 1912, and the Emperor himself is encouraging the Navy League in its agitation for more ships and men. This is the remarkable spectacle which is presented at this moment, and yet there is apparently no realization in this country that any danger threatens it. The Navy League has done splendid service in the past, but it is doubtful whether in the emergency which is now coming whether in the emergency which is now coming into view it ought not to endeavor to organize a great demonstration of British public opinion. The nation is unmoved because it does not yet realize what is happening. It does not know that the British fleet is about to shed practically all the pre-dreadnought ships and is replacing only a portion of them. On the other hand, it does not yet know that the powers of the Triple Alliance are not only replacing every vessel as it becomes obsolescent, but are steadily adding to their establishment.—*Naval and Military Record.*

SUCCESS OF NAVAL "RANKERS."—The First Lord of the Admiralty had a very good story to tell to the members of the House of Commons when he introduced the navy estimates for the current year in respect to the men from the ranks in the navy who had been selected to qualify as naval lieutenants. There are thirteen of these mates at sea, and the reports which are arriving at the Admiralty about them continue to be very satisfactory. By the end of the present financial year, *i. e.*, on March 31, 1915, their lordships hope to have 101 naval rankers qualified as naval lieutenants. There are at the moment 66 mates and acting mates serving on the quarter-deck, and at the various schools of instruction, who have served on the lower deck, and 35 more are to be selected shortly and placed under training. But in all probability this number will have to be doubled to meet the requirements of the navy by 1920. That is the hope of the men of the lower deck, and many of the leaders are alive to the fact that the recent breeze about the officers of the aristocrat-officered regiments of the army has not lessened the chance of continued progress in the democratising of the quarter-deck of the navy. Straws show which way the wind blows, and it is already noticed that the term "ranker" no longer conveys, or is intended to convey, the invidious meaning attached to it only a few years ago. On the contrary, the term "ranker" is being used to indicate an officer who knows his work, and who is sure to be a trustworthy and efficient officer, no matter to which branch he belongs.—*United Service Gazette.*

THE PACIFIC PROBLEM.—Though the Admiralty maintains a policy of masterly inactivity, the interested dominions are forcing into the forefront of public attention the problem of the defence of the Pacific. Ministers may point, as Mr. Churchill pointed the other day, to the arrangement with Japan as giving to these overseas peoples a complete assurance of safety. The truth, however, is that these people do not want to live on sufferance. Their present position is an impossible one. On the one hand they are refusing to permit Asiatics to settle in their lands, and on the other they are informed by the Imperial authorities that they must be content to accept the protection of an Asiatic power. It is an unfortunate thing that public opinion in this country will not take the Pacific problem seriously. This ocean, it is true, is a long way away, and it is admitted that at the moment the dominions are in absolutely no danger. It is, however, a danger to the Empire when the people of the mother country keep their eyes fixed upon European affairs and refuse to take any account of the movements which are going on in other parts of the world. The British Government has got to face the problem of the Pacific, and the longer it postpones its consideration the more difficult it will become to find a solution at once practicable and acceptable to all sections of the Empire. The latest reminder of the urgency of this question reaches us from Auckland, where General Sir Ian Hamilton has delivered an important speech, in which, as no mean

strategist and something of an Imperial politician, he has practically thrown over the Imperial Government. He remarked that the Pacific is "the meeting ground not of nations, but of continents, and that there it might be decided whether Asiatics or Europeans should guide the destinies of this planet." His remarks indicate acute sympathy with the peoples of Australia and New Zealand and the attitude which they have taken up towards Asiatic immigration. The write and yellow peoples cannot live side by side on terms of equality. The white man represents a higher civilization, and cannot live for a day on what will sustain an Asiatic for a week. The white peoples know the peril of Asiatic immigration, and are determined to resist it at all costs, because they realize that wherever the yellow man obtains a footing the white man disappears, not so much because there is any antipathy between the two, but because the Asiatic underbids the white man in the labor market and in trade. This on the one hand. On the other we are continually reminded that the British Empire is incurably Asiatic, and we cannot as an Empire condemn all Asiatic expansion. This is why Downing-street endeavors to evade the discussion of the Pacific problem. But sooner or later it must be faced, if we are to avoid a crisis which may well shake the whole foundations of the Empire. Not only must some sort of concordat be reached, as it can be reached, but some scheme of co-operation with the dominions concerned for the more adequate defence of Pacific waters must be arranged.—*Naval and Military Record.*

WHY AUSTRALIA ACCEPTS COMPULSORY SERVICE.—On the general question of compulsory service in Australia, the conditions there and in this country are entirely different, and no useful comparison can be drawn between them. It is not only geographically that Australia is the antipodes of England. Even if Sir Ian's report should confirm that he is entirely convinced that the Australians have chosen the wisest course in surrendering themselves to a legally organized system of compulsory training, it would not affect the question as applied to this country in the slightest degree. Apart from all questions of Imperial defence, Australia has to consider problems which are peculiarly her own, and which, in her opinion, evidently constitute in themselves perfectly sufficient reasons for seeking to ensure the utmost preparedness for possible war. Her well-known policy of keeping Australia white, and avoiding the racial problems with which the United States and South Africa are beset, is one of the principal factors in the situation. This is no new development, but it has long been a part of the general attitude and policy of the Australians in working towards national self-realization. It can hardly be said to be an Imperial question, but it is one upon which the Australians themselves are practically undivided, and the need for being prepared for eventualities arising out of this policy is emphasized by what has been happening in recent years along the shores of the western Pacific. Australia cannot be indifferent to the fact that Japan and China are becoming democratized and westernized, and there is no doubt that the necessity for defending the barrier she has herself set up against the incursion of the yellow races, has had much to do with the general acceptance of compulsory military service by the people. If Sir Ian Hamilton should find it well to give his blessing to compulsion in Australia, it will not be because he is a time-server as the *Morning Post* ungenerously insinuates, but because he has seen on the spot how real to the colonists are these two factors of a white Australia and the yellow peril.—*United Service Gazette.*

THE POLICY OF FOLLY.—The British authorities are showing a singular want of statesmanship in dealing with the Pacific problem; but, on the other hand, the Ministers of the dominion are showing no great wisdom. The whole white population of the Pacific is not as large as that of the counties of Yorkshire and Lancashire, and yet their politicians are talking menacingly of what they will do if the mother country does not speedily come to their aid. This is sheer folly, because these distant peoples have every-

thing to lose by alienating the sympathies of the taxpayers of the United Kingdom, who in the present year are not only providing a large expeditionary force for the Empire, but are paying £51,500,000 for naval defence. We who live on this side of the world have watched in admiration the growth of a spirit of independence in Australia and New Zealand, but we cannot help wondering where the present policy will eventually lead them. Australia is proud of her one armored ship, the group of cruisers, nd the flotillas of torpedo craft. We are asked to regard it as the nucleus of a great fleet. The politicians of New Zealand are busying themselves over a scheme for training officers and men for service at sea. But what can it all lead to? If these two dominions secure the partial co-operation of Canada, the combined movement will not provide naval forces half, or even a quarter, as strong as those under the Japanese flag. The only protection which can be complete must be afforded by the Royal Navy. Colonial opinion has not yet been educated. It is forgotten that the British Navy exists only that it may fight battles in the last resort. The scheme of British defence presumes that the combined naval forces under the white ensign will be maintained at such a strength as will make war an unprofitable venture on the part of any other country. Whatever isolated action the dominion may take—and they are well advised to provide local flotillas—the main defence of every Imperial interest will continue to be the great battle fleets, and not local forces, however numerous the latter may be. Colonial politicians, by encouraging their followers to place confidence in localized forces, are incurring a grave peril at the very moment when British supremacy—the general supremacy of the seas—is more seriously challenged than at any time during the past hundred years.—*Naval and Military Record.**

ARMED MERCHANTMEN.—The May *Marine Rundschau*, dealing with the British navy estimates for the current year, quotes Mr. Churchill's explanation of the arming of British merchant ships as a simple measure of self-defence, but still remains unconvinced. "As far as our knowledge goes," says the Admiralty organ, "no other nation has as yet followed England's example in arming its merchant ships. Against what armed merchant steamers, therefore, are the English ships to defend themselves? To warships, including, of course, auxiliary cruisers, such as England herself has provided for in the *Mauretania* and *Lusitania*, they are ordered to surrender."

The repeated allusions in German books and press articles to the paralyzing blow which would be struck at the food supply of the United Kingdom in the event of war with Germany could be read only in one sense. On this point General von Bernhardi's famous book "Germany and the Next War" may be quoted. This eminent strategist states (page 270, German edition) that: "In addition to the struggle against the enemy's (England's) navy, the war against commerce must be carefully prepared for in time of peace, for especially against England would this form of warfare be most effective, seeing that more than any other country she is dependent on imports. It might be of the greatest importance, therefore, if we succeeded in seriously cutting-up the enemy's trade and in interrupting his routes. Our preparations must aim at enabling the specially fast ships which are destined for the war against commerce to reach their spheres of operation before the enemy is able to blockade our harbors. The auxiliary cruisers, even in peace time, must be so equipped that at the shortest notice and on the high seas they can assume the character of warships on receipt of a wireless order." And again (page 176): "The war against English commerce must be attempted with audacity and energy, and as far as possible by surprise."

---

* See references to current papers, page 1265.

The Berlin correspondent of the *Naval and Military Record* comments that the sudden appearance on the British trade routes of a host of German armed merchantmen, converted into men-of-war on the high seas at a wireless word from Berlin, would have fulfilled this suggestion to the letter.

It is obvious that something more than a few legitimate "auxiliary cruisers" which Germany owns to was in General von Bernhardi's mind. The eight such ships which figure in the official list—all great liners of the Norddeutscher Lloyd or Hamburg-Amerika Line—would no doubt be kept under observation at a period of political tension, and any deviation from their regular route would be promptly known. But it would be otherwise with the rank and file of the German merchant fleet, and a number of these ships, not necessarily speedy, might play havoc with the British food-carriers if at a wireless code message they were able to produce guns from the hold and convert themselves into "auxiliary cruisers" by the simple process of hoisting a naval ensign. It is against such a contingency —which, whether real or imaginary, is constantly being hinted at by responsible German writers—that the British authorities have seemingly endeavored to provide. It is not without significance that the only country in which an outcry has been raised against this measure of precaution is in Germany itself.—*The Naval and Military Record.*

ALEXANDRA DOCK AT BOMBAY.—The new Alexandra Dock at Bombay, which was formally opened to shipping in March, has an area of 49½ acres. The depth is 37½ feet at mean high water. The port trustees are constructing a large railway receiving and sorting yard, and it is expected that the existing methods of freight handling will be revolutionized. The Hughes Dry-dock, attached to the Alexandra Dock, will accommodate the largest battleship in the British Navy. The trustees are also constructing a passage between the Alexandra and Victoria Docks, which will provide four more 500-foot berths. In addition the harbor-wall frontage will extend for a length of nearly 6000 feet, and will provide other berths. The port will, when these large extensions are completed, be capable of accommodating three times the tonnage for which berths were lately available. The new dock will enable passengers to step from mail steamers directly into trains to proceed to the farthest corners of India, while the postal department is provided with a large sorting shed where mails can be expeditiously handled on arrival.—*The Nautical Gazette.*

NAVAL TRAWLERS.—A contemporary has recently been calling attention to the excellent trawling fleet that the navy possesses for its war purposes. There are no more hardy, intelligent and brave set of seamen around our coasts than those who man our fishing trawlers, and it is fit that the navy should make use of their skill in managing their vessels, and their intimate knowledge of every inch of the waters of their locality, to the advantage of the nation in time of war. Their duties would be to fish for derelict mines, or to work for the destruction of a minefield laid by an enemy along any part of our coastline; they could also be used for like purposes on an enemy's coast if within the orbit of their working radius. It is less than five years ago that such a force was considered necessary to the navy, and only just over three years since the work of organizing a trawling branch of the Royal Naval Reserve was taken in hand. Yet last year nearly 700 ranks and ratings were put through a course of practical instruction at the work it will be their function to perform in time of war. The total number of the force at the end of the financial year, when it was still short of deck hands, stood at the following respectable figures: Skippers, 108; second hands, 152; deck hands, 343; enginemen, 268; and trimmers, 121. With the passing of each year this strength will be augmented, and the men will become more efficient, until, useful already, it will grow into an important branch of our offensive and defensive naval power.

CANADA AND A UNITED EMPIRE.—That well-known authority on Canadian affairs, Mr. W. H. P. Jarvis, writing on the subject of the loyalty which permeates the people of that vast dominion, points out that the intensity of this feeling is a riddle to himself, as well as to many others, and that, though it has had to withstand many shocks, it still thrives. He remarks, further, that their loyalty to the Empire was particularly noticeable at the last General Election, and he is of opinion that Englishmen are unable to appreciate the intensity of this sentiment, and that even the Canadian people themselves are not quite able to understand it. One is tempted to offer the comment that, strong as this feeling may be, it does not appear to be strong enough to enable the Canadian people to sink their political and financial differences, and to settle the question of the naval contribution to Empire defence. Persistently as we have supported the spirit shown by the Canadian people in the past, we feel that, after the events arising out of the naval contribution question, we must withdraw from the position we had originally taken up. The view is largely held on this side that our Canadian cousins are fast becoming Americanized, and that, to use a well-worn metaphor, though they like to think of the old Union Jack fluttering over their homesteads in the Far West, they are nevertheless bending their ears to the screech of the American Eagle. We would ask them to look further ahead; to forget for the moment the influences by which they are immediately surrounded, and to which their continental position subjects them; to bring before their mental vision their great Pacific seaboard, and to give a thought to the vital significance in that connection of the awakened nations of the Far East. It is not unreasonable to assume that, within the lifetime of the present generation, the Pacific may become the theater of a terrific struggle, and if Canada is threatened it will not be to Washington that Canadians will look, but to the old country. It is, therefore, of vital importance that they should insure themselves while the opportunity is with them, and prepare for that contingency. We firmly believe that, if it were not for the chaos at present existing in China, the menace of the "yellow peril" would be nearer to becoming a reality, instead of, as at present, a nightmare, and that, in any case, the encroachment of these teeming millions on the western seaboard is a factor that will have to be reckoned with in the not distant future.—*United Service Gazette.*

THE PANAMA TOLLS AND EXHIBITION DIFFERENCES.—The fact that the two questions of the Panama Canal Tolls' dispute and the decision of the British Government not to participate officially in the exhibition at San Francisco, are both before the public just now, probably accounts for the impression which undoubtedly exists that they are in some way connected, and that the opposition to the repeal of the tolls clause is a factor inspiring the British Government's action in regard to the exhibition. We are aware that this has been denied, and that it has been repeatedly stated that the sole cause underlying the action of the government is the knowledge that the great manufacturers of this country are of opinion that participation in the exhibition at San Francisco is not worth the expense involved. This may pass for an official explanation, but when it is considered that the beneficial results of co-operation on the part of the government and the manufacturers of this country in this enterprise are not to be measured by the value of the exhibits, or the expense which would be incurred in sending them over, it is a little difficult to believe that this is the sole ground of the objection. Obviously, it would be impossible for Britain to say in so many words, "Drop your opposition to our claim for a strict adherence to the terms of the Treaty, and we will agree to official representation at your exhibition"; yet there is little doubt that if this opposition was withdrawn the government would be disposed to reconsider their position. It would be a pity if such a relatively small matter as official participation in an exhibition should be allowed to mar the friendly

relations between the two countries at the present time, when we are actually celebrating the centenary of peace between English-speaking peoples. There is greater need than ever for the two nations to draw together, in view of the bigger question of the menace from the Far East, to which we have alluded elsewhere in this issue, and beside which the tolls and exhibition disputes are trivial and insignificant.—*United Service Gazette.*

CANADIAN DOCK AT ESQUIMALT.—It is reported that the Canadian Government intends to invite tenders for a dry dock at Esquimalt capable of accommodating the largest ships in the navy. The cost is estimated at between £300,000 and £400,000.—*The Engineer* *

GREECE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battle Cruisers					
Salamis	19,500	23	8 14-in., 12 6-in., 12 3-in.	Vulkan Works, Stettin	Laid down July, 1912
.....	24,000	21.5	10 14-in.	Saint Nazaire	Reported that negotiations have been completed for this ship.

PURCHASE OF "IDAHO" AND "MISSISSIPPI."—The purchase of a large modern battleship by Turkey has made it necessary for the Greek Government greatly to strengthen its navy, if it is to hold its present superiority over the navy of its ancient foe. Negotiations have been opened for two of our pre-dreadnought ships, the *Idaho* and the *Mississippi,* and the price which is named will be just sufficient to cover the cost of a ship of the same class as the *Pennsylvania.*

Of the more modern of our pre-dreadnought battleships, the *Idaho* and the *Mississippi* are the two which can be best spared; and this, not for the reason that they are not of first-class quality, but because they are what might be called an odd size and do not fit in well with our other ships of approximately the same date. The *Idaho* and *Mississippi,* which are sister ships, were built under an authorization by Congress, in which, unfortunately, their displacement was definitely limited to 13,000 tons. They are small editions of the *Louisiana* and *Connecticut,* the difference being that they are of 3000 tons less displacement and of one knot less speed, that their armor is lighter, and that their broadside secondary battery is weaker by the omission of four 7-inch guns.

Except for these differences, they may fairly be considered as of the *Connecticut* class, and, therefore, they are thoroughly representative of the period immediately preceding the advent of the dreadnought. In fact, they were laid down the same year in which the first dreadnought was being con-

* See references to current papers, page 1265.

structed. Each ship carries four 12-inch 45-caliber guns and eight 8-inch 45-caliber guns in turrets, and eight 7-inch guns in a broadside battery on the main deck. Each ship has two submerged torpedo-tubes of the new 21-inch type. The best recent speed of the ships has been a trifle over 17 knots. They are protected by a 9-inch belt associated with a 3-inch armored deck, and they have from 12 to 8 inches of armor on the turrets. The lower deck and the main deck in the wake of the 8-inch battery are protected by 7 inches of armor.

The purchase of these two battleships would mean a very great increase in the fighting strength of the Greek Navy, of which, indeed, they would become the principal and most effective fighting units. At present, the most formidable ship in the Greek Navy is the *Giorgios Azeroff*, of 9956 tons, carrying four 9.2-inch and eight 7.5-inch rifles, with twenty-four smaller guns. She did very effective work during the Balkan War, and her speed of 24 knots enabled her to attack when she pleased.

It is interesting to note that the powerful dreadnought recently purchased by Turkey is to be met by a Greek battle-cruiser, now under construction at Stettin, Germany, which will carry eight 14-inch and twelve 6-inch guns. But she will not be ready for some time to come, at least a year or two. Hence the advantage to the Greeks of the immediate possession of two such heavily armored ships as the *Idaho* and *Mississippi*.—*Scientific American.*

A check for $12,535,275.96 was accepted by Secretary of the Navy Daniels at noon to-day in payment for the battleships *Mississippi* and *Idaho*, which became the property of the government of Greece. The check was signed by Frederick J. Gantlett, vice-president of the Newport News Shipbuilding and Drydocking Company, who acted as agent for the Greek Government in the purchase. The check was turned over to the Treasury Department by Mr. Daniels.

The *Mississippi* is now at Hampton Roads and the Greeks are prepared to put a crew on board immediately. Commander Tsukalos will be in command and the *Mississippi* will bear the name of *Kilkis*. The *Idaho*, which is now in the Mediterranean with a party of Annapolis cadets on board, will be transferred to the Greeks at Villefranche or Gibraltar.

Secretary Daniels said to-day that the department will be able to advertise for bids for two battleships on August 1.—Washington, July 8.—*New York Sun.*

"FEI HUNG" PURCHASED.—The cruiser *Fei Hung*, built by the New York Shipbuilding Company for the government of China, but later sold to Greece, is lying at its dock in Camden, N. J., ready for delivery, but its destination is kept a secret. It is reported that the vessel will leave for the Near East under orders from Athens because of the tension between Greece and Turkey. The vessel is a 2600-ton cruiser. She carries two 6-inch, four 4-inch and two 3-inch guns, two 6-pounders, two 3-pounders and two torpedo-tubes.—*Army and Navy Journal.*

TRANSATLANTIC STEAMER "VASILEFS CONSTANTINOS."—The Greek steamer *Vasilefs Constantinos* was launched at Birkenhead, June 9. She is the first of two building by Messrs. Cammell Laird, of Birkenhead, for the National Steam Navigation Co., of Greece, and is named after the King of Greece. She will be the largest vessel owned by the Greek mercantile marine, and is intended for the transatlantic service between Greece and the United States. —*Shipping Illustrated.*

ITALY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Giulio Cesare ...	22,022	22	13 12-in., 18 4.7-in.	Genoa	Trials April 1914
Conte-di-Cavour	22,022	22	13 12-in., 18 4.7-in. 14 14-pdr.	Spezia	Launched Aug. 10, 1911
Leonardo da Vinci	22,022	22	same	Genoa (Odero)	Trials April 1914
Andrea Doria...	22,564	23	13 12-in., 16 6-in.	Spezia	Launched March 30, 1913
Duilio.....	22,564	23	same	Castellamare	" April 24, 1913
4 ships	28,000	24	8 15-in., 16 6-in.	....	Will probably be laid down during spring and summer, 1915
Small Cruisers					
Basilicata	2,500	16.5	6 6-in.	Castellamare	Laid down Aug. 9, 1913
Compania	2,500	16.5	6 6-in.	"	" Aug. 9, 1913

NOTE.—Italy has about 15 destroyers and two submarines under construction.

"AUDACE'S" SPEED 36.2 KNOTS.—The destroyer *Audace*, built by Orlando, has made some remarkably successful trials. This boat displaces 680 tons and has a length of 239½ feet, a beam of 23 feet, designed horse-power 15,000, going a speed of 30 knots, and burns oil only. On a three hours full-power run the engines worked up to 20,000 S. H. P., the mean speed for the run being 35.5 knots, with a maximum of 36.2. The fuel consumed was well below the contract limit, and the performance is the more creditable in view of the rough sea which prevailed. The turbines worked very smoothly, and at full speed there was an entire absence of vibration. For a destroyer to exceed its contract speed of 30 knots by 6.2 knots is believed to be a world's record. There are ten of these boats in all, six of which have been built by Pattison and four by Orlando. The six Pattison boats have light armor protection over boilers and engines. All are armed with one 4.7-inch and four 12-pounders and two tubes.—*Naval and Military Record.*

ITALIAN DOCKYARDS.—At the present time there are seven private yards in Italy which build vessels for the navy. An eighth is about to be established at Taranto by the Franco Tosi Company, which manufactures turbines and oil motors at its Leguano works. The new yard will not be in full operation before July, 1915, but it has already received a contract for two 700-ton destroyers of the *Impavido* type.

Two interesting little craft are under construction at Epezia dockyard. These are the torpedo-boats *39 R. M.* and *40 R. M.* Their displacement is 120 tons, and they are to be fitted with oil motors to develop 2000 horse-power, from which a speed of 32 knots is expected.—*Naval and Military Record.*

NAVY USED TO PUT DOWN THE GENERAL STRIKE IN ITALY.—Incredible as it may seem, the general strike in Italy as it proceeded became actually anti-dynastic, and, according to alarmists, even threatened the existence of the monarchy. The most turbulent regions were the Romagna, or "Emilia," as it is now officially known, and the Marches to the south, both on the Adriatic. Trade and traffic were disorganized throughout this region, which for days was a center of anarchy.

The movement was directed not only against the government, but also against the church. Throughout Italy fourteen churches were burned,

about forty others damaged, and over twenty others looted. Perhaps the most remarkable occurrence took place at Senigallia, on the Adriatic, which from the early Christian ages has been the seat of a bishop. Here the vandalism of the rioters and strikers applied the torch to the cathedral and the two other churches, entirely destroying one of the latter and burning out the interior of another. A detachment of cavalry arrived at the cathedral in time to save it from being destroyed as well. A torpedo-boat arrived at Senigallia, with a large company of sharpshooters, who have put down the disorder. Warships have been sent to other Adriatic ports.

JAPAN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Fuso.....	31,300	22.5	12 14-in., 16 6-in.	Kure	Launched Mar. 28, 1914
Fuso 2d.....	31,300	22.5	....	Kawasaki	Date when these ships will be laid down has not yet been settled.
Fuso 3d.....	31,300	22.5	....	Mitsubishi	
Fuso 4th.....	31,300	22.5	....	Yokosuka	Laid down Nov. 20, 1913
Battle-Cruisers					
Hiyei.....	27,500	27	8 14-in., 16 6-in., 8 t. t.	Yokosuka	Commiss'd Mar. 31, 1914
Haruna.....	27,500	27	same	Nagasaki	Launched Dec. 14, 1913
Kirishima.....	27,500	27	same	Kobe	" Nov. 30, 1913

NOTE.—Japan has two destroyers and two submarines under construction in England and France respectively.

JAPANESE DREADNOUGHT "FUSO."—According to the *Marine Rundschau* the Japanese super-dreadnought *Fuso* was recently launched with her engines and guns in place. It seems likely that the Japanese Navy will be the first to have a battleship in commission carrying twelve 14-inch guns. This ship is of about 30,000 tons displacement, and she will have a secondary battery of sixteen 6-inch rapid-fire guns. She is down for completion in July, 1915, and a sister ship, also building in Japan, is due to be completed a year later.—*Scientific American.*

Battleship No. 4, a sister to the *Fuso*, is declared by the *Marine Rundschau* to have been laid down in February; but as a result of the large reductions in the budget, there is some prospect of it being impossible to proceed with the work of construction for some time to come. Battleships No. 5 and 6, which are to be built at Kobe and Nagasaki respectively, have not yet been laid down.

PURPOSE OF JAPAN'S NAVAL PROGRAM.—Writing from Tokio a correspondent of the *New York Evening Post* says that the efforts of Japan at naval expansion are directed, not against us, but against her whilom antagonist, Russia. This writer says:

"In the first place, it is more of a possibility that Russia should return to the fray to recoup her losses and regain her laurels in the Far East than there is likelihood of any other country making an attack upon Japan

Nor is this supposition altogether fanciful. The writer was once assured personally by a high and responsible representative of the Czar that his country never could be content to let matters stand in the Far East as the Portsmouth conference left them; and this same high official went further and declared it his conviction that in that day both Great Britain and America would be found on the side of Russia in the struggle.

"Japan herself will not, of course, admit any such fear; but that it exists and inspires her vast program of naval and military defenses no one familiar with the trend of things in the Far East can well doubt. What is the meaning of all this agitation for an increase of army divisions in Korea, if it is not merely an echo of the underlying policy suggested? Russia herself is concentrating all her financial resources on similar preparations. War with America is not impossible, but it is improbable, because financial and diplomatic circumstances are wholly against it, to say nothing of America being Japan's best commercial customer. Their interests, while common, are yet sufficiently distinct to leave each to its separate sphere of development. And the same may be said of Japan's interest in Australia, New Zealand and the South Pacific.

"A comparison of the fleet that faced Russia with the present naval strength of Japan will further indicate to what extent the naval program have been executed, as well as the nation's position as a naval power on the Pacific. Japan met Russia with six battleships, eight armored cruisers, 44 minor cruisers, as well as other warcraft, including 80 torpedoboats and 19 destroyers, representing 157 ships, with a total tonnage of 283,743. To-day the Japanese Empire commands a mighty fleet of 15 battleships, three of which are of dreadnought strength; 13 first class armored cruisers, seven second class cruisers, 13 third class cruisers, representing an aggregate tonnage of no less than 453,115, to say nothing of her 60 destroyers, 59 torpedoboats and 13 submarines, as well as her efficient aerial corps." —*Army and Navy Journal.*

STARVING THE JAPANESE NAVY.—From some points of view it is a very serious matter for England that Japan has become so involved in internal strife that her naval building program is likely to remain attenuated, and her naval expansion policy crippled for some years. British colonies under the Southern Cross, and even Canada, may, peradventure, not hold this view, since some of the colonists are obsessed with the "yellow peril scare." But after all the days of "splendid isolation" are propably over for Great Britain, and if alliances are necessary for the better security of the Empire, and with a view of keeping the naval burden of the taxpayers of the mother country within bearable limits, there is no alliance within the area of practical politics of more importance than the alliance with Japan, and that chiefly for naval reasons. When, therefore, we learn that the current budget of Japan has been so cut about that it is with the utmost difficulty that its government will be able to meet its present naval commitments, there is ground for grave concern on England's part. A sum of 6,000,000 yen will be required to meet instalments due during the present year to foreign shipbuilding firms, who have ships in hand to order of previous Japanese governments, and no provision has been made for the money. Royal dockyards will have to be closed down in Japan, and naval work suspended in all directions to meet foreign commitments, unless a different frame of mind is created in the present official advisers of the Mikado; and most of this trouble has arisen over financial stress and a naval scandal.—*United Service Gazette.*

STUDY JAPANESE PROBLEM.—*Commissioner Appointed at Request of Ministers in Nippon.*—At the request of many American ministers resident in Japan the Federal Council of the Churches of Christ in America, repre-

senting 30 different denominations, 136,000 congregations and 17,000,000 church members, has decided to make an intensive study of the Japanese problem with a view of promoting the good feeling between the peoples of Japan and the United States. The teachings of Christ will be used as a medium for better international understanding.

A commission of 15 men will have charge of the investigation. They are the Rev. Charles R. Brown, Prof. Charles R. Henderson, Hamilton Holt, the Rev. Albert G. Lawson, Bishop Francis J. McConnell, the Rev. Frank Mason North, Robert E. Speer, the Rev. William I. Haven, Bishop E. R. Hendrix, Prof. Jeremiah W. Jenks, the Rev. Frederick Lynch, John R. Mott, the Rev. Doremus Scudder, George E. Vincent, and Amos P. Wilder.

Prof. Sidney Gulick, who lectured on the Japanese problem in the principal cities and who laid the council's plan before Washington officials, will continue to lecture under the supervision of the new commission. —*New York Sun.*

JAPANESE SHIP COMBINE.—*More Details of How it will Utilize the Panama Canal.*—Tokio, June 2.—The news first published in London that three Japanese steamship lines have united to rival British and German lines in utilizing the Panama Canal has been confirmed here. The lines in question are the Nippon Yusen, the Osaka Shosen, and the Toyo Kisen. Of these three the Nippon Company is the largest and most important. It owns about 90 steamers, of an aggregate of some 400,000 tons.

The Nippon Company not only runs a mail line to London, but has a main line to Australia and links up Japan with the United States. It is credited with a proposal to run a service across the Pacific and through the Panama Canal to New York. Similar intentions have been attributed to the Osaka and Toyo companies. Some expectation has even been engendered that, with the aid of the Suez and Panama Canals, the Japanese will completely navigate the world.

Whatever happens, it is obvious that the problem before Japan is the judicious distribution of its mercantile marine in order effectively to maintain its hold on the trade of the Pacific and the Far East, as expanded by the sundering of the Isthmus of Panama. It is pretty obvious that this aim will best be served by a complete understanding between the Japanese lines, such as will eliminate all unnecessary competition between them and mark out for each a definite sphere of action.

The Osaka Company is returned as owning upward of 110 vessels of an aggregate of close on 200,000 tons. The Toyo Company has half a score of liners, three at least of between 13,000 and 14,000 tons. Its aggregate tonnage may be roughly estimated at about 100,000. Between them, using rough figures, it may be taken that something between 600,000 and 700,000 tons of shipping is concerned, or about half that under the single flag of the Hamburg-American Line, or under the individual direction of the Royal Mail Steam Packet Company.

The strength of the Japanese flag lies less in the size than in the number of the ships which it covers. There are no fewer than 200 vessels in the service of the three companies. The steamers of the Osaka Company are largely engaged in coasting trade, so that they are relatively small in size and help to bring down the average. The largest and newest vessels of the Nippon Company are of 10,500 tons, and have been introduced into its mail line to London.

The Japanese combination is necessarily both anti-British and anti-German. The two great German lines, no less than the leading English lines have their plans cut and dried for the utilization of the Panama Canal. They have also their interests in the Far East. Japan is evidently out to checkmate them as far as she can, and her basic position in the Pacific unquestionably gives her some advantage. Her competition is ruthless, as

is evident by her encroachment upon the carrying trade of British India and the refusal of reciprocal treatment. A war with the British India Company has been raging in the Far East for many months, and is apparently as far from termination as ever.—*New York Sun.*

NORWAY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruisers					
Bjorgvin	5000	16.5	2 9.4 in., 4 6-in., 6 4-in.	Messrs. Armstrong	Laid down Jan. 8, 1913
Nidaros	5000	16.5	same	same	Launched June 9, 1914

NOTE.—Norway has four submarines under construction.

The launch of the battleship *Nidaros* at Elswick on June 9 serves to remind us of the fact that Great Britain is still pre-eminent as the warship-building nation of the world. Other powers continue to place orders in England for the vessels which they find it necessary from time to time to add to their fleets. That they should do so in the face of the competition in this direction which has sprung up of late years may be regarded as testimony to the value of the goods they have received in the past. It is timely to recall that all the battleships now in the Norwegian Navy were built on the Tyne by the famous Elswick firm. The *Eidsvold* and *Norge* were launched there in 1900, and the *Haarfagre* and *Torkenskjold* in 1896 and 1897 respectively. These ships were also engined by a Tyneside firm, Messrs. Hawthorn, Leslie & Co., who likewise have received the order for the machinery of the *Nidaros* and her sister. Both the builders of the hulls and engines of the new vessels are to be congratulated on the confidence which the Norwegian authorities evidently place in their productions, and in the credit which is rightly due to the firms concerned the country at large may be said to have a share. Turning to the design of the *Nidaros*, it is to be noted that while it shows a development over earlier Norwegian ships, the principles underlying the construction of coast defence battleships for the Scandinavian powers of late years have not been departed from. These powers show no inclination to go in for dreadnoughts, which could not very well fit in with their present naval policy and organization. They prefer small ships of about 5000 tons displacement, which are large enough for the power required, and which can be navigated easily in waters which would be impassable by vessels of larger draft. As regards relative strength, Norway and Denmark are running one another pretty close, each having now six battleships built and building, but Sweden, of course, has about double this number.—*Army and Navy Gazette.*

ROUMANIA

Four Roumanian torpedo-boat destroyers of 1450 tons displacement are being built at the Patterson yard, Naples. They are to be propelled by Tossi turbines and to steam 35 knots. This type of turbine is also to be fitted in the eight new 700-ton Italian destroyers and they will be designed to develop 9000 shaft horse-power.—*Nautical Gazette.*

RUSSIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Sevastopol	23,026	23	12 12-in., 16 4.7-in.	Baltic Works	Launched June 29, 1911
Petropavlovsk	23,026	23	same	" "	" Sept. 9, 1911
Poltava	23,026	23	same	New Admiralty	" July 10, 1911
Gangut	23,026	23	same	" "	" Oct. 7, 1911
Emperor Alexander III	22,435	21	12 12-in., 20 4.7-in.	Nikolaieff	" Apr., 1914
Empress Marie	22,435	21	same	Ivan Bunge Co.	" Nov. 3, 1913
Catherine II	22,435	21	same	" " "	Laid down Sept. 1, 1912
Battle Cruisers					
Ismailia	32,200	28	12 14-in., 21 5.1-in.	Galerni	" Dec. 19, 1912
Kinburn	32,200	28	same	Baltic Works	same
Borodino	32,200	28	same	Galerni	same
Navarino	32,200	28	same	Baltic Works	same
Small Cruisers					
Adm. Butakow	7,500	32	15 5.1-in.	Putilow, St. Petersb.	Laid down Nov. 29, 1913
Adm. Spiridov	7,500	32	same	" "	" Nov. 29, 1913
Svietlana	7,500	32	same	Neval	" Dec. 7, 1913
Adm. Grieg	7,500	32	same	"	" Dec. 7, 1913
Muravjev Amurski	4,500	..	8 5.1-in.	Elbing	Launched Apr. 11, 1914
Adm. Nevelskoj	4,500	..	same	"	Laid down Feb. 13, 1913
" Lazarev	7,500	32	15 5.1-in.	N. F. & W. Nikolaieff	" Oct. 19, 1913
" Nachimow	7,500	32	.....	R. S. Co. "	same

NOTE.—Russia has about 45 destroyers and 19 submarines under construction or contract.

RUSSIAN ARMY.—The Russian Army now numbers about 1,700,000 trained soldiers. After April 14, when the 4th class is sent home, the army will number 1,300,000 men. The time of service for infantry remains at three years, that for the scientific other arms is for four years. There will be no difficulty in providing an additional 150,000 recruits this year, which, with a similar increase for the next two years, will bring the permanent peace effectives up to 1,760,000. Russia is the first of all countries in the world in excess of revenue over expenditure, amounting in 1911 to £30,783,000, as compared with the United States excess of £9,490,698, and Great Britain's £6,545,186. Germany's defict for the same year was £10,529,054, and that of France was nearly £6,000,000. As the *Russki Invalid* properly points out, Russia's force is far below the armies of Germany and Austria, in proportion to the extent of frontiers respectively guarded. On a proportionate basis Russia would require a peace effective of 3,000,000 men.—*Army and Navy Journal.*

SPAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Espana	15,450	19.5	8 12-in., 20 4-in.	Ferrol	Commiss'd Oct. 23, 1913
Alfonso XIII.	15,450	19.5	same	"	Launched May 7, 1913
Jaime I	15,450	19.5	same	"	Laid down Feb. 5, 1912

TORPEDO-BOAT FOR THE SPANISH NAVY.—*Constructed by the Sociedad Española de Construccion Naval.*—The work of building up the new navy for Spain is proceeding satisfactorily. Of three battleships one is ready for commission, another is nearly ready for trial, and the third will soon be launched. Correspondingly satisfactory progress has been made with the torpedo-boats, of which twenty-four were embraced in the program. The principal condition attaching to the building up of this new fleet was that all the vessels should be constructed in Spain, by a Spanish company with the co-operation of foreign shipbuilders. The Sociedad Española de Construccion Naval was formed to undertake the carrying out of the program, and they secured the assistance of three important British firms—Messrs. Sir W. G. Armstrong, Whitworth & Co., Limited, Messrs. John Brown & Co., Limited, and Messrs. Vickers, Limited. In the case of the torpedo-boats, however, it was considered desirable that the designs should be prepared by the Société des Chantiers et Ateliers Augustin Normand, of Havre, and these plans, after examination by the British firms, were approved by the Spanish Government, and working drawings were subsequently supplied by Messrs. Normand.

The particulars of all the boats are as follows:

Length between perpendiculars..	50.00 m. (164 ft.)
Length on load water-line	50.00 m. (164 ft.)
Length over all.....	52.55 m. (172 ft. 5 in.)
Breadth, extreme	5.24 m. (17 ft. 2 in.)
Mean draft	1.47 m. (4 ft. 10 in.)
Displacement	186 tons (metric)

The armament includes three torpedo-tubes firing 18-inch torpedoes; two of these are twin mounted and the other single mounted on the upper deck, and arranged to fire on either broadside. There are also three 3-pounder guns, arranged at convenient positions on the upper deck. This armament, considering the small displacement of the boats, is of real military value in view of recent developments in torpedoes. There are two boilers of the Normand type, burning coal only, placed in the same compartment. Each boiler has a grate surface of 5.7 square meters (61.4 square feet) and heating surface of 250 square meters (2691 square feet), and a working pressure of 18 kilograms (256 pounds per square inch).

The turbines fitted in the first ten vessels are arranged on three shafts. The turbines are of the Parsons' reaction design, and were built by the Sociedad Española de Construccion Naval at their works in Spain. The starboard shaft is driven by a high-pressure turbine, which exhausts into an intermediate-pressure turbine arranged on the port shaft, and from thence the steam passes into a low-pressure turbine, driving the center shaft.

Forward of the low-pressure turbine, and rigidly coupled to it, is a cruising turbine. At cruising speeds steam is admitted directly to the cruising turbine, and passes through the high-pressure, the intermediate-pressure, and the low-pressure turbines, exhausting into the two condensers, which are arranged one on each side of the low-pressure turbine. The turbines are designed so that at full power the center shaft driven by the low-pressure turbine develops 50 per cent of the normal power, the wing shafts each contributing 25 per cent. An astern turbine is built in the same casing as the low-pressure turbine, and steam can be admitted to this turbine from the maneuvering gear. In the event of accident to either of the wing shafts, both these can be cut out of the steam circuit and steam admitted straight to the cruising turbine and thence directly into the low-pressure turbine.

The center shaft, driven by the low-pressure turbine, is designed to run at about 1100 revolutions per minute, the wing shafts running at 1500 revolutions per minute. With these revolutions the designed speed was 26 knots. The speed on the four hours trial by the various boats with full load on

board has varied between 27½ and 28 knots. As typical of the results, we give some details of the performance of No. 4 boat:

Speed on cruising trial	20.08 knots
Speed on four hours full-power trial	27.9 knots
Speed on measured-mile full-power trial	27.297 knots
Mean revolutions on measured-mile full-power trial (center shaft)	1224
Mean revolutions on measured-mile full-power trial (wing shafts)	1745
Coal consumption at 14 knots	450 kg. per hour 992 lb. per hour

The power developed was not taken in any case. For details and drawings see *Engineering*, May 1, 1914.

TETUAN BOMBARDED.—Spain has been unfortunate this year in Morocco. The dreadful tornado at Millilla where the pier and many ships were destroyed, made things difficult on the east flank. Not far from Tetuan on the west, the Spanish ship *General Concha* was wrecked last year on the Riff coast. The Moors captured one of her guns. With this piece of ordnance they have begun a bombardment of Tetuan! Several shells have fallen within the town, and a Spanish soldier has been killed. The Mahomedan population is much alarmed. The mere fact that the tribesmen have been able to bring a gun into range of a town occupied by over 40,000 excellent Spanish troops, defended by a good artillery, has done much damage to Spanish prestige and has raised enthusiasm among the mountaineers. The efforts of the Spanish artillery to silence this ship's gun (which has now been firing for a week) have hitherto proved unavailing. The general situation around Tetuan has not improved, fighting being of daily occurrence. Desertions among the native troops are numerous, and in one instance the deserters are said to have murdered a lieutenant and two non-commissioned officers before escaping.—*Army and Navy Gazette.*

SWEDEN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruiser					
Sverige	7100	22.5	4 11-in., 8 5.4-in.	Gothenburg	Laid down Feb. 15, 1913

TURKEY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Reschadieh	23,500	21	10 13.5-in., 16 6-in.	Vickers, Barrow	Launched Sept. 3, 1913
Birindje Osman	27,500	22	14 12-in., 20 6-in.	Armstrong	Launched Jan. 22, 1913, in Rio de Janeiro

The dimensions of the new Turkish dreadnought, which is to be built at Barrow, are now available. Her length b. p. will be 565 feet, her length over all 597 feet 6 inches, her breadth to outside of armor 90 feet, her displacement in tons 24,700, and her speed with forced draft 21 knots. She will carry 13.5 guns, similar to those in the *Reshadieh*, together with 6-inch guns and 12-pounders. Her boats will consist of two 56 foot steam pinnaces, one 45 foot steam pinnace, one 42 foot motor launch, two 32 foot cutters, and two 30 foot cutters, one 30 foot gig, one 36 foot sailing pinnace, one 27 foot whaler, two 18 foot dinghies, and two 10 foot balsa life rafts. —*Shipping Illustrated.*

THE OTTOMAN FLEET.—Turkey has no really modern battleships, and therefore the impending completion of two dreadnoughts from British yards will materially increase her effective strength. The *Reshadieh* and *Osman I* (the latter formerly known as the Brazilian *Rio de Janeiro*) were both launched in 1913, and should be ready for trials before the end of this year. A third dreadnought has been ordered from Messrs. Vickers, who are completing the *Reshadieh*, and this firm and that of Armstrong Whitworth have received a number of other contracts from the Turks. These include two scouts, the hulls of which are to be built on the Tyne and the machinery at Barrow; six destroyers, in the construction of which Messrs. Hawthorn Leslie are to co-operate; and a floating dock to lift the largest vessels. A flotilla of 12 destroyers, six to be delivered at once and six in three years' time, has been ordered from Messrs. Normand and Co., but it does not appear that any submarines are building or have been ordered. The programs of the two powers are therefore: Battleships or battle-cruisers, three each; light cruisers, Greece four, Turkey two; destroyers, Greece 12, Turkey 14; submarines and seaplanes, six and ten respectively for Greece, none for Turkey. If the submarines and seaplanes are ready to take part in a conflict, should one occur, some interesting light may be thrown on a problem which is now very much exercising public attention. It is already being suggested that the two completed Greek submarines should attempt to catch the Turkish battleships while they are on their way to the Dardanelles. The Porte has at present no submarines, but there may be some flying craft which could be adapted for use as seaplanes. The effective Turkish Fleet includes the two ex-German battleships, one or two other old battleships, the modern protected cruisers *Hamidieh* and *Medjidieh*, about ten destroyers and eight torpedo boats. It appears to be rather weaker than the Greek fleet as regards torpedo craft. Not only are the destroyers fewer in number, but the biggest vessels, the German-built 610-ton *Muavenet-i-Millet* class, of 35 knots and carrying two 3-4-inch and three tubes, are smaller than the 980-ton Cammell Laird boats, of 32 knots, carrying four 4-inch and four tubes. Turkey has an advantage in her two protected cruisers, which are capable of doing over 22 knots, and are unmatched in the Greek Navy at present, and as regards her armored strength, while she may have weight and size on her side, she has not a vessel combining speed with gun-power as in the design of the *Averoff*.—*Army and Navy Gazette.*

The Chantiers & Ateliers Augustin Normand of Havre have just received from the Turkish Government an order for 12 torpedo destroyers to cost about $772,000 each. Six are to be constructed at once and the remainder in the next three years.—*Nautical Gazette.*

TURKISH SEA-GOING TORPEDO BOATS.—The new Turkish sea-going torpedo boats which have been ordered from Normand, of Havre, will be of 1040 tons displacement, 287 feet long, fitted with Parsons turbines developing 22,000 horse-power, and a speed of 32 knots. The armament will consist of five 4-inch guns and six 21-inch tubes.—*The Engineer.*

UNITED STATES
VESSELS BUILDING

Number	Name	Displacement	Speed	Armament	Where Building	Remarks
	Battleships					
34	New York....	27,000	21	10 14-in., 21 5-in., 4 t. t.	N. Y. Navy Yard	Commissioned
36	Nevada.....	27,500	20.5	same	Quincy	Launched July, '14
37	Oklahoma....	27,500	20.5	same	Camden	Laid Down Nov. 4, '12
38	Pennsylvania	31,400	21	12 14-in., 22 5-in., 4 t. t.	Newport News	" " May —, '12
39	....	31,400	21	same	N. Y. Navy Yard	....

ARMAMENT FOR NEW WARSHIPS.—The 14-inch guns and mounts for the new battleships *Oklahoma* and *Nevada* have been completed and shipped from the Washington Navy Yard. As these are the first 3-gun turret ships built for the navy, their completion will be looked forward to with considerable interest. There are a number of new features in the construction of the mounts, and the guns are the last word in ordnance construction. The *Nevada*, now under construction by the Fore River Shipbuilding Company, was launched at Quincy, Mass., on July 11. The *Nevada* is a sister ship of the Oklahoma, and is of the latest dreadnought type. The *Oklahoma* was launched at Camden, N. J., on March 23. The keel of the *Nevada* was laid on November 4, 1912. The *Nevada* will be of 27,000 tons displacement and 554 feet long.—*Marine Journal.*

"BROOKLYN."—The cruiser *Brooklyn*, laid up at Philadelphia, which has not been at sea for more than six years, is to become receiving ship at Boston. The *Brooklyn* was first put into commission in 1897. She is 400 feet long, mounts eight 8-inch and twelve 5-inch guns, and has an agenda speed of 21 knots.—*Shipping Illustrated.*

THE DESTROYER "MACDOUGAL" MAKES 32.07 KNOTS.—While running her standardization trials the new destroyer *MacDougal*, built at the Bath Iron Works, made a maximum speed of 32.07 knots for one mile and averaged for five full-speed runs 31.52 knots. The *MacDougal* measures 300 feet on the water-line, 30½ feet beam, 9 feet 5 inches draft, and displacement is 1025 tons. She is armed with four 4-inch 50-caliber guns and eight 18-inch torpedo tubes. She is an oil burner, carrying a supply of 309 tons of oil.—*Scientific American.*

The submarine torpedo-boat *K 7* was successfully launched at San Francisco June 20.—*Shipping Illustrated.*

LAUNCH OF THE "FULTON" AT FORE RIVER.—The U. S. S. *Fulton*, the first submarine tender built for the U. S. Navy, was launched at the works of the Fore River Shipbuilding Corporation at nine a. m., June 6. This vessel, the first of her type, was built from the plans of the New London Ship & Engine Co., at Groton, Conn., by whom her engines were built. She is of special interest as being the first large vessel built in this country equipped with Diesel heavy oil engines. There have already been built a number of merchant ships equipped with heavy oil engines in Germany, but in this country this type of engine in the past has been confined to submarines. The New London Ship & Engine Co. has developed a commercial engine of large size, and adapted for use on merchant vessels. This vessel, unlike most naval ships, was built to merchant specifications, and when in service will be the mother ship for a division of submarines. She is about 226 feet long, and her engine is of about 1000 horse-power, which is expected will give her a speed of about fourteen knots.—*Nautical Gazette.*

NAVY DEPARTMENT
BUREAU OF CONSTRUCTION AND REPAIR
VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY, JULY 10, 1914

Name, type and no. of vessels	Contractor	Per cent of completion			
		July 1, 1914		June 1, 1914	
		Total	Per cent on ship	Total	Per cent on ship
Battleships					
36 Nevada	Fore River S. B. Co.	69.7	60.7	67.0	57.0
37 Oklahoma	New York S. B. Co.	71.6	68.7	69.0	65.6
38 Pennsylvania	Newport News S. B. Co.	37.4	28.8	33.8	24.7
39	New York Navy Yard	17.4	14.3	13.1	10.6
Destroyers					
45 Downes	New York S. B. Co.	95.3	95.3	95.3	95.3
51 O'Brien	Wm. Cramp & Sons.	70.7	67.0	68.0	64.4
52 Nicholson	Wm. Cramp & Sons.	69.4	65.7	66.4	62.4
53 Winslow	Wm. Cramp & Sons.	69.0	65.4	63.2	59.0
54 McDougal	Bath Iron Works	Del'v'd	6-16-'14	95.8	95.7
55 Cushing	Fore River S. B. Co.	50.8	45.5	44.8	39.4
56 Ericsson	New York S. B. Co.	73.5	73.0	69.6	68.9
57 Tucker	Fore River S. B. Co.	10.9	4.4	9.7	3.9
58 Conyngham	Wm. Cramp & Sons.	8.4	2.2	7.7	1.9
59 Porter	Wm. Cramp & Sons.	8.2	2.2	7.6	1.9
60 Wadsworth	Bath Iron Works.	35.7	29.7	24.8	19.1
61 Jacob Jones	New York S. B. Co.	13.3	5.2	9.9	1.8
62 Wainwright	New York S. B. Co.	13.3	5.2	9.9	1.8
Destroyer Tenders					
2 Melville	New York S. B. Co.	55.5	52.5	50.6	49.4
Submarines					
26 G-4†	American Laurenti Co. (Phila.)	96.4	95.5	96.4	95.5
27 G-2*	Lake T. B. Co. (Bridgeport).	89.7	89.7	89.7	89.7
31 G-3*	Lake T. B. Co. (Bridgeport)	82.3	81.9	82.3	81.9
34 K-3	Electric Boat Co. (San Fran.)	96.8	96.8	94.2	94.2
35 K-4	Electric Boat Co. (Seattle)	96.8	96.7	94.2	94.1
36 K-5	Electric Boat Co. (Quincy)	97.8	97.8	95.7	95.7
37 K-6	Electric Boat Co. (Quincy)	97.8	97.8	95.7	95.7
38 K-7	Electric Boat Co. (San Fran.)	93.3	92.8	91.6	91.1
39 K-8	Electric Boat Co. (San Fran.)	91.8	91.0	90.0	89.5
40 L-1	Electric Boat Co. (Quincy)	40.5	35.7	34.6	29.3
41 L-2	Electric Boat Co. (Quincy)	40.3	35.4	35.0	29.7
42 L-3	Electric Boat Co. (Quincy)	39.3	33.9	34.4	29.4
43 L-4	Electric Boat Co. (Quincy)	39.1	33.7	34.0	28.5
44 L-5	Lake T. B. Co. (Bridgeport)	22.0	18.4	14.2	11.1
45 L-6	Lake T. B. Co. (Long Beach, Cal.)	17.9	14.1	11.5	6.9
46 L-7	Lake T. B. Co. (Long Beach, Cal.)	16.6	12.7	11.0	6.3
47 M-1	Electric Boat Co. (Quincy)	29.3	24.0	25.7	20.5
48 L-8	Portsmouth, N. H., Navy Yard	0.0	.....	0.0	.....
49 L-9	Electric Boat Co. (Quincy)	7.7	3.6	5.3	2.3
50 L-10	Electric Boat Co. (Quincy)	7.7	3.6	5.3	2.3
Submarine Tenders					
1 Fulton	New London S. & E. B. Co. (Quincy)	74.0	72.7	67.4	64.8
2 Bushnell	Seattle Construction & D. D. Co.	41.7	32.4	36.6	27.1
Fuel Ships					
13 Kanawha	Mare Island Navy Yard	65.0	64.5	57.1	56.4
14 Maumee	Mare Island Navy Yard	31.8	27.0	28.4	23.8
Miscellaneous					
Supply Ship No. 1	Boston Navy Yard	0.0	.....	0.0	.....
Transport No. 1	Phila. Navy Yard	0.0	.....	0.0	.....
Pan. Canal Colliers					
Ulysses	Maryland Steel Co	23.4	15.8	.....	.....
Achilles	Maryland Steel Co	20.0	10.8	.....	.....

*Contracts forfeited, vessels being completed New York Yard.
†Conditionally delivered at Philadelphia Yard, January 22, 1914.

GOVERNMENT WILL RESUME WORK ON BIG HAWAIIAN DRY DOCK.—San Francisco, July 6.—The work of constructing the immense dry dock, which was part of the big scheme adopted by the Navy Department for the fortification of Pearl Harbor, on the island of Oahu, Hawaii, is to be resumed in the near future, according to a naval constructor of high rank, who has left this city for the island. The officer said that the revision and reletting of the contracts for completing the dry dock would be concluded in Washington within the next two weeks.

Work on the Pearl Harbor dry dock stopped a year ago, when the partially completed concrete collapsed on account of the sandy nature of the bottom of Pearl harbor. There was much criticism of the Navy Department's plans and some said it was impossible to build a dry dock there. The Navy Department has persisted in its stand that a dry dock in Hawaii sufficient to accommodate the largest battleships is essential to an effective strategic scheme for safeguarding the American possessions in the Pacific.—*New York Sun.*

GIVING ENLISTED MEN A GREAT OPPORTUNITY.—The following amendment to the naval appropriation bill was agreed to in conference last week and will consequently become law. It reads as follows:

"Providing that there may be appointed annually from the enlisted men of the navy who are citizens of the United States and not more than twenty years of age, and who have served not less than one year, fifteen enlisted men to the United States Naval Academy, to be selected in the order of merit by competitive examinations prescribed by the Secretary of the Navy, and such men so selected are required to pass the physical and mental examination now required by law for entrance to the Naval Academy."

This is a splendid opportunity for young men who enlist in the navy to satisfy their ambition in the endeavor to be one of the chosen few to go to the Naval Academy, and if it is in them, later in life reach the highest position attainable in that service. This recent act of Congress will, beyond a doubt, encourage enlistments and induce young men of superior intelligence to remain in the service longer than heretofore, with the hope of reaching the academy, and afterward the quarter-deck of a warship.—*Marine Journal.*

NAVAL APPROPRIATION BILL.—The President on June 30 signed the Naval Appropriation bill. Last year's building program consisted of but one super-dreadnought, six destroyers, four submarines, one transport and one supply ship. Though this year's bill is $484,717.92 less than last year's, it provides a building program of two super-dreadnoughts, six destroyers and eight or more submarines, one of which will be able to accompany the fleet, the first of her kind, and allows for the construction of a third super-dreadnought by authorizing the sale of the *Idaho* and *Mississippi* and applying the proceeds to the new ship.

Congress has largely endorsed the Department's recommendations. The navy is a sea-going institution, and strict adherence to the principle that expenditures ashore should be subordinated to expenditures afloat has given us these great advantages in new building. Yet, while the fleet is greatly strengthened, generous provision is made for expenditures ashore that are urgently required for efficiency and future economy. Two hundred thousand dollars is appropriated to enlarge the navy's powder factory so that it may after a while, if necessary, supply all our wants. There is also provision for extending the torpedo works at Newport and for new building slips at Boston and Philadelphia, thereby increasing the military efficiency of the navy in this regard and assuring more competition. There will be need for another large drydock on the Pacific coast, particularly in view of the San Francisco Exposition, and as the navy is not prepared to construct one of its own, we are authorized to enter into an agreement for

the use of the new dock to be built at Hunter's Point, San Francisco. This dock will be capable of handling any ship which may pass through the Panama Canal.

All these shore improvements and the further allowance of an amount with which to entertain foreign naval officers and men who will attend the Panama-Pacific Exposition are made possible by retrenchments accomplished through economies and insistence upon competition. There has been a reduction of a million and a half dollars in the appropriation for public works; $400,000 in the Bureau of Steam Engineering and Construction and Repair; $700,000 in the Bureau of Ordnance and over $200,000 in the Marine Corps estimates. It was this same practice that enabled the Department to save approximately $1,000,000 on the construction of battleships No. 39.

Legislation along other lines has been as liberal and wise. A board is appointed to investigate and report upon the important question of an armor plate factory. A substitute for the present archaic system of cost accounting in the construction work in the navy yards opens the way to enable the navy to secure competition or do more building in its own plant.

By increasing the appropriation for disciplinary barracks we will be better enabled to extend corrective methods for treating offenses in the service. The aviation corps is assured of development, and the scope of the engineer corps is broadened. Heretofore their work has been narrowly confined. Now members of the corps can be assigned to any duty on shore.

For many years there has been agitation for an increase in the corps of chaplains. The need of it has never been more urgent than now. At present the corps embraces only 24 men, just the same number as in 1840, when the whole navy had but about 10,000 sailors and marines. Congress has approved the Department's recommendation for an increase and authorized one chaplain for every 1250 men, which will increase the corps to 52. It is provided that a chaplain must first serve three years in the grade of acting chaplain before he shall be appointed to the corps proper. It has sometimes happened pastors, rectors and priests who have served most acceptably ashore have been at their best in the navy. It is expected that this period of probation will enable the chaplain and the Department to decide more accurately as to his fitness for the work before a formal commission is issued.

The Secretary of the Navy may hereafter appoint 15 enlisted men to Annapolis annually. This splendid innovation is in line with the Department's recommendation that 25 be allowed to enter. The additional avenue for advancement, it is believed, will encourage study and retain in the service many splendid young men who have been leaving the navy because of lack of opportunity for advancement. The bill provides that any enlisted man who has served one year and is under the age of 20 may participate in a competitive examination, and that the 15 standing the highest may be appointed to Annapolis upon their meeting the prescribed tests. No phase of the bill is more pleasing.

So much sound and progressive legislation has seldom been concentrated in one measure. Congress is to be congratulated upon passing this great act, and the members of the House and Senate Committees on Naval Affairs and their chairmen deserve our thanks for their wise, patient and conscientious study of their subject, and for their cordial co-operation with the Navy Department in providing for the national defence afloat. —*Army and Navy Journal.*

DISAPPEARING PREPONDERANCE.—If the policy of laying down only one keel every 12 months had been persevered in very much longer the American fleet would soon have become one of the smallest in the world. During the next few years it will lose the preponderance which it obtained during the period of naval enthusiasm which followed upon the American-Spanish war. It is interesting to recall the United States program since these hostilities, because it indicates the rise and fall of naval sentiment

in the United States, and the figures of German construction form an interesting contrast.

Date	Battleships U. S.	Battleships Germany		Armored cruisers U. S.	Armored cruisers Germany
1898	3	2	....	—	1
1899	4	3	....	2	1
1900	2	2	....	3	—
1901	—	2	....	—	—
1902	2	2	....	3	1
1903	5	2	....	—	1
1904	1	2	....	2	1
1905	2	2	....	—	1
1906	1	2	....	—	1
1907	1	3	....	—	—
1908	2	4	....	—	—
1909	2	4	....	—	—
1910	2	4	....	—	—
1911	2	4	....	—	—
1912	1	2	....	—	—
1913	1	3	....	—	—
	31	43		10	7

This table shows that in the seven years between the Spanish War and the opening of the dreadnought era Congress authorized the construction on the average of four new armored ships every year. Since the coming of the dreadnought no further armored cruisers have been built, and on the average only one and a half keels have been laid down each year. It is apparent from these figures that the American fleet is shrinking in contrast with the fleets of other countries, and none too soon Congress has realized the necessity for embarking upon a more energetic program. —*Naval and Military Record.*

RUMOR OF DIVIDING THE BATTLESHIP FLEET.—Plans are under consideration for the creation of two battleship fleets, one for the Atlantic and one for the Pacific. If this change is made it will be delayed until next year, after the Canal has been opened. In connection with this change in the organization of the fleet is a proposition for transferring the southern drill grounds from Guantanamo to the Magdalena Bay, on the Pacific coast. In the opinion of some of the officers at the Navy Department, the Atlantic fleet as it is now organized is becoming unwieldly. Especially will this be true when the battleships now under construction are placed in commission. Then there have always been advocates of a disposition of the ships of the navy so as to maintain two fleets of equal strength in the two oceans. It is insisted by some of the highest authorities on naval affairs that the largest fleet should be maintained in the Pacific Ocean, as it is apt to be needed there before it is in the Atlantic Ocean. There is no doubt that the Magdalena Bay is more desirable as a drill ground and maneuvering place than Guantanamo. The division of the Atlantic fleet contemplates joint maneuvers of the two fleets at least once a year in the Magdalena Bay. An annual trip through the Panama Canal and into the Magdalena Bay would make the service on the Atlantic fleet more attractive to enlisted men than the program which has been followed in recent years. A trip through the Panama Canal for maneuvers would be less expensive to the government and would afford better opportunities for the training of the officers and men of the fleet than a trip to Europe. In the event of a division of the fleet the maneuvers at Magdalena Bay may include some very interesting battle problems which could be worked out with the two fleets.—*Army and Navy Journal.*

BATTLESHIPS AS PEACEMAKERS.—The decision of Congress to sell the two pre-dreadnoughts *Idaho* and *Mississippi* to Greece was influenced to no little extent, it is rumored, by the desire of President Wilson to avert war between Greece and Turkey. That the sudden increase in the naval strength of Greece by the acquisition of these two ships has served to prevent a seriously threatened renewal of the Balkan hostilities, is believed by those who are familiar with the naval and diplomatic conditions so far as they affect Turkey and Greece. Certainly the naval situation, as recited below, justifies this conclusion.

During the Balkan War the Greek Navy showed a decided superiority over that of Turkey; but the situation was completely reversed, at least as fas as regards *materiel*, when Turkey recently purchased the powerful dreadnought which is nearing completion at the yard of the Vickers firm in England. This ship, the *Rio de Janeiro*, which was illustrated in the *Scientific American* of May 31, 1913, is one of the largest and most powerful dreadnoughts yet constructed. With a length of 660 feet, a displacement of 27,500 tons, and a speed of 22 knots, she mounts the largest 12-inch battery in the world, carrying, as she does, no less than fourteen 12-inch, 50-caliber guns in seven 2-gun turrets. In addition to this she has a secondary battery of twenty 6-inch, 50-caliber guns. Her main battery, be it observed, is more powerful by two guns than that of our *Arkansas* and *Wyoming*.

Now the purchase by Turkey of this powerful ship had completely altered the relative standing of the two navies; for with her overwhelming gunpower and good speed of 22 knots, she would have been capable of handling unaided the whole Greek fighting line. Hence it can be understood that, in the recent trouble with regard to certain islands that have been ceded to Greece, Turkey felt herself to be in a position to enter into a controversy, which, should diplomacy fail, would be settled in her favor upon the high seas.

Greece, in her dilemma, looked around for some ready means of turning the tables upon Turkey and backing up her diplomacy by a show of superior naval strength. It so happened that the *Rio de Janeiro* was not quite completed and would not be available for use by Turkey for some little time; and when, as the result of her search in the battleship market of the world, Greece found that two thoroughly equipped and well-seasoned battleships of the United States Navy were available for sale, the negotiations were opened which have resulted in the purchase of the *Idaho* and the *Mississippi*.

To those of us who understand the intimate relations between battleship strength and a nation's foreign policy, it is not surprising that this sudden reversal of conditions should have had the immediate effect of dissipating the war cloud and leading these two nations to arrange a peaceful compromise.

And so, once more, we see a concrete illustration of the truth that a preponderance of naval strength sufficient to secure the command of the sea, serves not as a provocative to war, but as a means, and a most effective means, of preserving the peace. Greece, exhausted by the recent struggle, had no desire to renew it; Turkey, eager to recover some of the prestige she has lately lost, and believing herself to possess a preponderance of seapower, would, no doubt have welcomed the conflict.

Battleships are cheaper than battles; and, as we have shown in our recent series of articles on the problem of our own navy, there is no surer way to preserve the peace than to maintain an adequate naval force, sufficient to discourage any foreign country from attempting to interfere with national policies by a demonstration of naval force.

As regards the relative advantages of this bargain, they are fairly well balanced between the two countries. For Greece, the acquisition of the *Idaho* and *Mississippi* means not only a great increase of strength, but the prevention of a war which would have cost far more than the price paid for the ships. As regards the United States it means the substitution for two pre-dreadnought ships of a modern dreadnought of the largest size and of

maximum offensive and defensive power. How great is our gain is shown by the following consideration:

For the sum derived from the sale of the *Idaho* and the *Mississippi*, whose aggregate displacement is 26,000 tons, we can build a 32,000-ton *Pennsylvania*, which is a clear gain of 6000 tons of displacement.

For the eight 12-inch guns of the two vessels, we secure twelve 14-inch guns—a clear gain of four 14-inch pieces.

The total muzzle energy of the eight 12-inch guns is 350,000 foot-tons. The total muzzle energy of the twelve 14-inch guns is 780,000 foot-tons—a clear gain of 420,000 foot-tons, which is an increase in hitting power of considerably over 100 per cent.

In place of the 9-inch armor on the *Idaho* and *Mississippi*, covering the water-line, we have 13½-inch armor on the *Pennsylvania*—a gain of 4½ inches in thickness, and a gain, furthermore, in the quality of the armor, due to later methods of treatment.

For the speed of 17 knots of the *Idaho* and *Mississippi* we have a speed of 21 knots in the *Pennsylvania*—a clear gain of 4 knots.

Finally, and most important of all, is the fact that in place of two of the smaller ships of our second line of battle we are able to put into our first line of battle one of the most powerful and up-to-date ships of the dreadnought class.—*Scientific American.*

OBSOLETE BATTLESHIPS' VALUE AS TARGETS.—Since the old battleship *Texas*, renamed the *San Marcos*, was first used as a target, in 1910, with live stock and human dummies aboard, she has been of inestimable service to the navy in gunnery development, and consequently naval officers are urging that other obsolete battleships, such as the *Indiana* and *Iowa*, should be detailed for this purpose. The hull and armor of the *San Marcos* having shown defects in the fuses of the explosive shells that could have been revealed in no other way, hence naval officers declare that if the fleet had not taken the opportunity of using this vessel or one similar as a target, faults in the structure and design of our shells might have exposed our navy to the charge that was laid to that of Russia in the battle of the Sea of Japan, of having loaded their shells with sand. The *San Marcos* has also solved a question of battleship construction, notably the need of more horizontal armor to protect the vitals of our newer dreadnoughts.

It is false economy on the part of the Navy Department to delay in using ships of the obsolete class, when such can be utilized to make those in active service more perfect. In this, foreign navies have set us an example worthy of serious consideration, as Germany has, recently, "shot up" four obsolete ships, and France three. England, in sinking the old *Empress of India*, it is believed, also learned valuable lessons for future construction as well as defence. It cost the government about $40,000 to maintain the *Indiana* last year, while the crews that such obsolete ships require, although small, place a tax upon the personnel of our navy, which is chronically short of officers and men. Also, as targets, such vessels are so far superior over those artificially provided that there should be no question of the Navy Department assigning them to this purpose.—*Marine Journal.*

NAVAL MILITIA MANEUVERS.—The naval militia maneuvers will be conducted along the lines of naval militia circular letter No. 20, issued last April, with some slight modifications. It has not yet been decided what battleship will be available for the Atlantic coast organization, although the *Rhode Island* is under consideration. The Oregon and Washington militia will cruise in the *Milwaukee*, making a trip to Honolulu. The California militia will cruise along the coast of southern California, conducting target practice at San Diego. In carrying out the provisions of the new naval militia law the Navy Department has asked the different states to appoint disbursing officers, who will be required to file bond with the Treasury Department. The work of inspecting the different organizations of the naval militia is now in progress. According to the provisions of the

new law different organizations of the militia must be armed, uniformed and equipped ready for duty before any funds can be furnished the states from the federal appropriation. States are a little slow in making requests for inspectors and instructors. The Navy Department is not overanxious to detail officers to this duty as there is a shortage of officers for the fleet, and the states will find that it will be difficult to procure officers for this duty when the time arrives when they are necessary for the development of the naval militia under the new law.—*Army and Navy Journal.*

GERMAN ANNUAL CRITICIZES AMERICAN NAVY.—The most serious difficulty with which the American Navy has to contend is the lack both of officers and men. Other hindrances to its proper development are party politics, lack of a definite naval program, and the insufficient supply of cruisers.

This is the opinion of *Nauticus,* Germany's foremost annual naval review, the sixteenth number of which has just been issued.

Nauticus, although published by private enterprise, is regarded as a high authority on marine affairs, and has an almost official standing. The critics who edit the review find the conditions in America particularly unfortunate as to younger officers. The youngest ensigns now in the service have no chance to become lieutenants before they are 40, and conditions are growing worse as a result of the failure of Congress to adopt the long-discussed measure to remedy the situation.

The lack of officers is so great that not even the battleships, to say nothing of auxiliary cruisers, could have their full complements in case of war. While the ships mainly have their full complements of men, there is an utter lack of trained reservists to replace the losses that would be caused in the first battle.

The efforts of the general board to obtain a definite fleet program under which the United States would have forty battleships in 1920 have, it is said, been made futile by the unwillingness of Congress to tie its hands for so long.

The continued presence of large fleet contingents in Mexican waters has interrupted routine practice, especially target work, with a resulting lower battle efficiency.

The disadvantages of the lack of a proper number of cruisers have made themselves plainly felt, but the Navy Department nevertheless maintains an attitude against the building of cruisers.

Nauticus says the marksmanship of the ships' gunners appears good, but one must guard against too boastful press reports. Target competitions between ships are favorably commented on as spurring gunners on to the highest accomplishments.

Nauticus does not intimate any doubt as to the excellence of the material of the American Navy units. While making no direct statement on this point, it appears to believe that the standard is high. It declares that Secretary Daniels has mastered the details of his department well, but his teetotal order is considered by the officers an intrusion into their private affairs.

Nauticus sharply criticizes America's foreign policy. It declares the United States has contented itself with expressing in speeches and resolutions its ideals of freedom and the equality of all races, but its practice has been dictated by the country's practical interests. This is shown by the opposition to Japan in the California land question and by America's conduct toward Mexico, "where it has endeavored to depose a distasteful president by supporting a bloody uprising and by the forcible occupation of foreign territory."

Nauticus finds a similar contrast between words and deeds in the adoption by Congress of the resolution favoring Mr. Churchill's "naval vacation" plan, while at the same time Mr. Daniels presented a bill demanding two battleships, whereas the Republicans in the last two years of their rule had voted only one yearly.

Nauticus approvingly calls attention to the speech of a Congressman whom it does not name, who declared that the United States through the adoption of the Panama Canal tolls bill and its attempts to grant a special tariff reduction to goods imported in American vessels had lost all credit as a nation that kept its treaty promises.—*New York Times.*

THE MONROE DOCTRINE.—In the *North American Review* for June appear two noteworthy articles on the Monroe Doctrine which should set at rest and permanently the misleading, distorted and dangerous conceptions of what it is, what it demands and what it justifies, of its scope and its limits, that have of late been sown broadcast by publications presumed to mold or at least influence public opinion at home and abroad. As is well and forcibly said in one, "grandiose schemes of national expansion invoke the Monroe Doctrine. Interested motives to compel South or Central American countries to do or refrain from doing something by which individual Americans may profit, invoke the Monroe Doctrine. Clamors for national glory from minds too shallow to grasp at the same time a sense of national duty invoke the Monroe Doctrine. The intolerance which demands that control over the conduct and the opinions of other peoples, which is the essence of tyranny, invoke the Monroe Doctrine. Thoughtless people who see no difference between lawful right and physical power assume that the Monroe Doctrine is a warrant for interference in the internal affairs of all weaker nations in the New World." Is it to be wondered at that in the light of such theories we are finding the Monroe Doctrine acting like a red rag to a bull on the minds of our neighbors from the Rio Grande to the Amazon as well as across the Atlantic?

The author of the first of these articles, entitled "Monroe Doctrine Fundamentals" is Prof. Theodore S. Woolsey, late of Yale University and a world-wide recognized authority on International Law, and of the second, "The Real Monroe Doctrine," United States Senator Elihu Root, formerly Secretary of State, and equally well known as an authority on International Law.

Professor Woolsey draws sharply the distinction between a national policy, which the Monroe Doctrine is, and a law, municipal or international, which it is not. A nation's policy is unilateral. Though affecting other states, it is formed without their consent; it may, therefore, be changed without reference to their wishes. It is changeable as self-interest dictates, and imposes no continuous obligation upon a state. We in the United States are quite accustomed to have the action of one administration disavowed by the next. In all these aspects policy and law differ. A rule of international law comes into being in the last analysis by the common consent of nations. It cannot be created, though it may be suggested, by a single power. A law is universal, not unilateral; it is fixed, not changeable unless changed by the consent of those who framed it, and is binding upon a state even if damaging to that state's interests. Bearing in mind these distinctions the author shows that the Monroe Doctrine has always remained what it was at its inception, a policy and nothing more. As such it originated and was maintained by reason of self-interest, not of altruism. It was—and is—justifiable by reason of the right of self-defence (which is a recognized principle of International Law). Mr. Monroe declared: "With the existing colonies or dependencies of any European power we have not interfered and shall not interfere. But with the governments (of South America) who have declared their independence and maintained it, and whose independence we have on great consideration and on just principles acknowledged, we could not view any interposition for the purpose of oppressing them or controlling in any manner their destiny by any European power, in any other light than as the manifestation of an unfriendly disposition toward the United States."

And again, "We owe it, therefore, to candor and to the amicable relations existing between the United States and those (European) powers, to

declare that we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety." In these words President Monroe characterized the proposed intervention of the Holy Alliance in this hemisphere, and such language we should doubtless use to-day were a great European power to seize Cuba or a South American republic, or a great Oriental power a slice of Lower California.

Senator Root quotes Thomas Jefferson as replying to President Monroe who consulted him regarding his message: "The question presented by the letters you have sent me is the most momentous that has ever been offered to my contemplation since that of independence. That made us a nation; this sets our compass and points the course which we are to steer through the ocean of time opening on us. . . . . Our first and fundamental maxim should be never to entangle ourselves in the broils of Europe; our second, never to suffer Europe to intermeddle with cisatlantic affairs." And later from Mr. Cleveland in 1895: "The doctrine upon which we stand is strong and sound because its enforcement is important to our peace and safety as a nation, and is essential to the integrity of our free institutions and the tranquil maintenance of our distinctive form of government. It was intended to apply to every stage of our national life and cannot become obsolete while our republic endures."

No one ever pretended that Mr. Monroe was declaring a rule of international law, or that the doctrine which he declared has become international law. It is a declaration of the United States that certain acts would be injurious to the peace and safety of the United States, and that the United States would regard them as unfriendly. Mr. Roosevelt said in 1906: "In many parts of South America there has been much misunderstanding of the attitude and purposes of the United States toward the other American republics. An idea had become prevalent that our assertion of the Monroe Doctrine implied or carried with it an assumption of superiority and of a right to exercise some kind of protectorate over the countries to whose territory that Doctrine applies. Nothing could be further from the truth." And he quoted the words of the Secretary of State then in office, to the recent Pan-American Conference at Rio Janeiro: "We deem the independence and equal rights of the smallest and weakest member of the family of nations entitled to as much respect as those of the greatest empire, and we deem the observance of that respect the chief guarantee of the weak against the oppression of the strong. We neither claim nor desire any rights or privileges or powers that we do not fully concede to every American Republic."

Such, then, is the scope, and such the limitations of the Monroe Doctrine as expounded by its author, confirmed by successive administrations and held by the Department of State for 90 years. And its original meaning and purpose may be expressed by the two words so familiar to the loiterer along every country road—*No Trespassing.—Editor's Bulletin, Journal of Military Service Institution.**

THE NICARAGUAN TREATY.—The Nicaraguan Treaty is now before the United States Senate.

It provides that Nicaragua shall not impair its independence by compact with any foreign power, or allow any such power to obtain military control; that Nicaragua shall not contract debts without providing that the country's revenues shall provide adequate interest and ultimate payment; that the United States shall pay to Nicaragua three million dollars and receive the exclusive rights to build an interoceanic canal across the country and to have a naval base on the Pacific side; finally, that the United States

* See references to current publications, page 1263.

may intervene "for the preservation of Nicaraguan independence and the maintenance of a government adequate for the protection of life, property, and individual liberty."

The above propositions indicate that the treaty would place Nicaragua in about the same relations with the United States as is Cuba, the privileges as to possible intervention and control being those insisted upon with Cuba through the famous Platt Amendment. It may be added, with regard to Cuba, that the American people have not attempted to make anything out of this advantage any more than out of Porto Rico or the Philippines. The spirit animating the proposed treaty is precisely the spirit which animated the Platt Amendment—a spirit free either from land covetousness or from political ambition.—*The Outlook.*

THE LATIN-AMERICAN VIEW OF THE PROBLEM OF OUR NAVY.—To the Editor of the *Scientific American*: I am sorry to note that your valued articles dealing with "The Problem of Our Navy" have been brought to a conclusion.

The continuance of such articles is the only way to bring to the mind of the people of the United States that the navy can be made practical; that it is a school for poor young men who lack educational opportunities; that it gives them a discipline second to none, and most of all, that the first-class policies of the United States, namely, Indivisibility of China, Asiatic Exclusion, the Monroe Doctrine, etc., can only be enforced by a large and strong navy.

This Monroe Doctrine, which has kept many a Latin-American republic from the jealous eye of the European powers, can only be maintained by a navy large and strong enough to make war with the United States a difficult task for these European powers, being as they are, 3800 miles away from their main naval bases, but with a great preponderance of capital ships—dreadnought type—this task could be accomplished by such powers.

All this you and the Secretary of the Navy have explained wonderfully well in your several articles.

If you were to ask all the more educated class of Latin-Americans what is the object of the great naval program which Germany has started a decade ago, the answer would correspond with yours: The Monroe Doctrine, the Panama Canal, and her great commercial interests with Central and South America.

I am positive that the better class of Cubans and Latin-Americans are more interested in the increase and efficiency of your navy than the average inland citizen of the United States. Your navy is the only friend that we Latin-Americans have that can keep the greedy hands of the nations of the Old World away from us, and dropping fast as she is to a fourth-class navy (not to a third-class as you say), we stand helpless at their hands in the event they should attempt conquest.

I noted in your recent articles that you often spoke of a first-class navy, that of England with forty-two dreadnoughts built and building; a second-class navy, that of Germany with twenty-six dreadnoughts built and building; and a third-class navy, that of the United States, with thirteen dreadnoughts built and building, with France and Japan close behind with eleven and ten of these ships, respectively. Permit me to say that you have not done justice to France. Perhaps it was an oversight on your part. The modern French Navy will be, I am sorry to say, superior to that of the United States. I shall make here a *rough comparison* of capital ships built, building, and authorized by both nations:

United States Ships.

	Tons.	Main battery.	
2 *Michigans*	32,000	16	12-in. guns
2 *Delawares*	40,000	20	" "
2 *Floridas*	43,650	20	" "
2 *Arkansas*	52,000	24	" "
2 *New Yorks*	54,000	20	14-in. "
2 *Oklahomas*	55,000	20	" "
2 *Pennsylvanias*	62,000	24	" "
Total tonnage	338,000		

French Ships.

	Tons.	Main battery.	
4 *Jean Barts*	94,000	48	12-in. guns
3 *Bretagnes*	70,500	30	13.4-in. "
4 *Normandies*	101,548	48	" "
4 (New ones)	116,000	64	" "
Total tonnage	382,048		

Assuming the weight of the 12-inch projectile of the United States and French navies to be 870 pounds; the weight of the 14-inch American projectile to be 1400 pounds; and the weight of the 13.4-inch French projectile to be 1433 pounds, in comparing gun power, we see that a single discharge of all the big guns of the fifteen dreadnoughts of the French Navy would throw a shower of deadly material weighing 245,246 pounds on a target of fourteen American ships, as against a discharge of 159,200 pounds of metal of one single round fire from all the big guns of the fourteen dreadnoughts of the American Navy, on a target of fifteen French ships. This shows a superiority of the French ships of 54 per cent in gun power, regardless of the fact that the projectile of the 13.4-inch gun of the French Navy, although of less diameter, has a greater muzzle velocity, and being heavier, is consequently more powerful than the 14-inch American gun. Of these large guns the American ships are equipped with sixty-four, as against one hundred and forty-two on the French ships. It must be borne in mind also that the two *Michigans* have less speed, and that the two *Michigans* and two *Delawares* are not as heavily armored as the four smaller French ships of the *Jean Bart* type; namely, the *Jean Bart, Courbet, Paris,* and *France.*

The United States, therefore, stands now as a fourth-class naval power in modern ships. In this *rough comparison* of gun power and tonnage, I have not included the battleships of the pre-dreadnought type, of which the United States has a great superiority, but no nation that looks forward to a first-class line of fighting ships would look upon them for reliance in future naval battles.

My only aim in bringing this comparison to your mind is to show you that as the matter now stands, the United States is dropping as a naval power at a higher rate than it is generally believed in your country, and which is looked at with regret.

Are many Americans also aware of the fact that the Italian Government has eight dreadnoughts built and building, and is now considering the construction of four 35,000-ton ships, each carrying twelve 15-inch guns in four triple turrets, the projectile of which guns weighs 1950 pounds; that the Spanish Government has just voted a credit of $324,000,000 for the construction of dreadnoughts, scout cruisers, destroyers, etc.?

I, therefore, encourage you, Mr. Editor, to have this subject of the navy on your publication every now and then, until you have convinced your people and your country of the necessity to build and keep a *second-class navy*, such as you had in 1906, to maintain peace, not to make war.

Please accept my heartiest thanks for your valued literature, and that of the Hon. Josephus Daniels, Secretary of the Navy, dealing with the subject mentioned above, which is of vital importance to your country, and to all America.

Since I am a foreigner, I must ask your pardon for my poor English.

Hormiguero, Cuba. IGNACIO VALDÉS.

—*Scientific American.*

LATIN-AMERICAN ATTITUDE TO THE UNITED STATES.—For the reason that we believe it represents the attitude of the intelligent Latin-Americans toward the foreign policy of the United States, at least so far as it affects the Western Hemisphere, we publish with much pleasure, and direct special attention to the above letter from a correspondent in Cuba. The writer has appreciated at their full value the motives and convictions which prompted our publication of the series of articles entitled "The Problem of Our Navy"; and we believe that if toll could be taken of the opinion of the more intelligent citizens of the Latin-American countries, it would be found that there is a general appreciation of the fact that the best guarantee of the inviolability of the New World against armed aggression by the nations of the Old World, is the possession by the United States of a fleet of such power, and in a condition of such thorough preparedness, that none of the navies of the Old World could measure arms with it, in the waters of the Western Hemisphere, without running the risk of a defeat.

It is discouraging, in view of what we have done in Cuba, to realize that there is a certain amount of distrust of the United States existing among the great mass of the people of the Latin-American republics. As an instance of disinterested and highly idealistic attitude toward a weaker state, the United States may point to the history of our relations with Cuba with a pride which is altogether justifiable. We entered that distracted island for the express purpose of regulating its many disorders and with the definite statement that we had no wish to permanently occupy territory, and with a pledge, further, to withdraw our forces as soon as a stable government had been established. That pledge we have fulfilled to the letter; and Cuba stands to-day as an undeniable proof of the fact, first, that the attitude of the government of this country to the rest of Latin-America is altruistic, in so far as we earnestly desire to see it prosper under strong, independent, and capable governments; second, that our attitude is egotistic, only so far as our government realizes that the abolition of revolutions, the harmonizing of contending factions and the setting up of orderly governments, conduces to the prosperity of the United States and promotes the advancement and solidarity of the Western Hemisphere as a whole.—*Scientific American.**

---

* See reference to current papers on Monroe Doctrine, page 1263.

ORDNANCE AND GUNNERY

In the last issue of the UNITED STATES NAVAL INSTITUTE PROCEEDINGS (No. 151) on page 888, appeared an extract from the *Scientific American* containing a criticism of Rear Admiral Joseph Strauss, Chief of the Bureau of Ordnance, based upon a statement reported to have been made by him before the House Naval Committee.

This criticism reads as follows:

"But there is nothing like first-hand information; and we have it from Sir Percy Scott himself, who during a lengthy conversation last year on director firing in general, informed the editor that the *introduction of director firing had increased the hits in target practice for the whole navy over one hundred per cent.*

"What then are we to make of the statement of Rear Admiral Joseph Strauss, U. S. N., Chief of the Bureau of Ordnance, before the House Naval Affairs Committee, on January 19, that the Scott director system 'had been experimented with in the American Navy and found not as accurate or satisfactory as the American method of firing salvos'? The American method is the old Scott method, and we have the best grounds in the world for stating that the director experiments referred to were not the true Scott methods, but only a guess at them, and a very wide guess at that.

"This depreciation of director firing by Mr. Strauss is most unfortunate, made as it was to the House Naval Committee, on whom the further policy of advancement so greatly depends. For the information of the House we repeat that the Scott system has never yet been tried out in our navy; the *Scientific American* learned last year by personal investigation that director firing is absorbing the closest attention of navy artillerists throughout Europe; that because of the lack of initiative in this matter in our Bureau of Ordnance we are already far behind one great naval power in target results; and that in view of the active work being done in director firing by Germany (to mention one other power), the results of which, the writer is reliably informed, are very promising, we are in danger in falling behind that country in target practice as far as we have in battleship strength." —*Scientific American.*

We learn that this report was misquoted, and regret that it should have been reprinted. The actual colloquy which gave rise to this report follows:

"The Chariman. 'Admiral, I wish to call your attention to a statement which I have noticed in the *Scientific American* in its issue of Saturday, January 3, 1914, in which this statement occurs:

"'"With the exception of the British Navy, which has more than doubled the accuracy of its fire by the introduction of the fire-director system of Sir Percy Scott, our shooting is believed to be as good as that of the other leading navies."

"'I wish to call your attention to that statement and to ask you what you have to say in reference to it. Do you agree with that statement?'

"Admiral Strauss. 'No, sir. We, of course, know about the director system. This last fall we fired a large number of shots from the *Delaware* by that system with not very promising results. We do not consider the experiment conclusive and propose now to have another test of firing with the same ship, which will be available for this work. Those who have studied the results of this shooting are not very enthusiastic about it.'"

GUNNERY CHARACTERISTICS OF THE "NORMANDIES."—The 25,300-ton *Normandies* will be remarkable ships from a gunnery standpoint. In addition to their spacious quadruple turrets better fitted in the matter of firing appliances, a revolving turret, forming the upper part of the conning-tower, will afford complete protection for the range-finders, which in previous battleships are left practically unprotected. The military value of such an innovation, which has for some time past been the object of

experiments in the gunnery cruiser *Pothuau*, is obvious, and more than makes up for the supplement of displacement it entails. As this is not the only improvement the *Normandies* have received since being placed in hand, these fine ships will be in service slightly heavier than designed, with the exception of the *Béarn*, fifth of the series, on the point of being laid down at La Seyne, which has benefited from a series of minor improvements and will displace a few hundred tons more than her sister ships.

The question of the battle range has become a new topic in naval circles owing to the much-commented on fact that the three general actions fought in the course of the strategic maneuvers occurred in the early hours of the morning, when deficient conditions of visibility caused fire to open between the contending lines of battleships at ranges of 6000 and 8000 meters, thereby depreciating to a certain extent the advantage conferred by heavy calibers. At such distances, it was noted, the volume of fire from 9.4, 7.6, and 6.4-inch guns can play no negligible rôle. As, moreover, last year's maneuvers offered instances of actions fought in semiobscurity, at still closer range, additional arguments are being supplied to those many officers who oppose the increase of size to the detriment of the number of guns on the plea that, whatever merits 15-inch weapons may possess at extreme ranges, they will find in practice few opportunities to utilize to advantage their superior penetration and smashing power. Night operations followed by contests at close quarters at daybreak will become the rule, they hold, in future warfare as the result of the advent of the submarine and aerial factors, which will compel the weaker party to use the cover of night either to force its way through a blockade or to carry out strategic movements such as the effecting of a junction with a friend. And under conditions of that sort, with every chance of fire opening at ranges well under 10,000 meters, 12 guns of 13.4-inch bore are claimed to be worth more than eight of 15 inches. These theories, however, received a severe blow when, in the last part of the maneuvers, Admiralissimo de Lapeyrère, facing with eight dreadnoughts (two *Barts* and six *Dantons*), good for over 18 knots at sea, the 14-knot squadron of Admiral Marin-Darbel (five *Patries* and four older battleships), conclusively demonstrated that a force possessing a substantial superiority for both speed and caliber of heavy guns, and familiarized with maneuvering at full speed in battle formation, will, besides selecting the time and range of the action, be in a position to effect a crushing concentration against the van of the enemy—a realistic lesson which much impressed those who witnessed it. The distance for a time maintained at 13,000 meters—rather too great for 12- and 9.4-inch weapons—would suit the 15-inch battery of the British *Warspites* and of their German and Italian copies.—*Naval and Military Record.*

MODERN NAVAL ORDNANCE.—To the Editor of the *Scientific American*: In No. 6, Vol. CX, February 7, you mention the French 13.4-inch gun: shell, 1433 pounds; velocity, 2657 feet. The energy by $\frac{mv^2}{2}$ works out equal 70,000 foot-tons, approximate. So this shell is, as you say, somewhat more powerful than our own 14-inch shell. If we take into consideration the very important factor of "ballistic coefficient," it would seem to me that the French gun shows a very considerably higher efficiency, as that factor is approximately as 8 to 7 in comparison with our 14-inch piece. This is shown by formula for ballistic coefficient: $\frac{w}{d^2}$; viz., weight of the shell divided by square of caliber of gun. The German 15-inch gun, which you mentioned some time ago, with its shell of 1667 pounds, would also look inferior to the French piece in that respect. What the weight of the British 15-inch gun's projectile is I know not; if it be 1800 pounds, it would be just about even with the French piece.

Would you kindly discuss these matters in your esteemed publication?

New Orleans, La. REV. J. H. MEYER, S. J.

—*Scientific American.*

ULIVI'S EXPERIMENTS IN EXPLODING BOMBS WITH INFRA-RED RAYS.—The press of Europe has much to say to-day about the experiments of the Italian engineer, Giulio Ulivi, who is said to be exploding bombs from a distance by means of the infra-red ray. The public exhibition in Florence a month ago, where four bombs floating on the surface of the River Arno were exploded in succession, has attracted much discussion. The *Scientific American*, in order that its readers may be in the current of popular opinion in the matter, presents an eye-witness story by a representative of the *Corriere della Sera* of Milan. The accounts lack the precision of scientific ones and are defective in just those places that a physicist particularly desires more information, but they seem to present a matter that is taken seriously in some quarters. It is evident that there is here either a belief on the part of the experimenter in his results or a splendidly well-staged act in necromancy. It is well further to say that there have been previous "demonstrations" by another which have some resemblance to these. They have been regarded with suspicion in scientific circles.

Ulivi chose for his assistant, Admiral Fornari, who at 9 o'clock one evening was rowed from the iron bridge into the middle of the Arno, placing in the water one after the other the four bombs. The fact of the immersion was communicated to Ulivi by means of flashes of light, and the return of the admiral to the river bank was also signaled.

The lights served to notify the Florentines of what was on foot, and in great numbers they gathered on the Lungarno. The houses along the river were teeming with population, even to their roofs. Carriages, autos, and trams carried unceasingly their passengers to the river and streams of pedestrians had the same goal. Some went to Monte Senario, where Ulivi had stationed himself. Accompanying Admiral Fornari were officers and engineers invited by the Minister of War to view the experiment.

"All at once," according to the *Corriere*, "the darkness was rent by a blinding flash, there was an explosion with a shower of sparks and these lighted a cloud of smoke that for a while hung over the river." In a quarter of an hour the second bomb was fired, and after about an equal interval, the third. The bombs had been floating with the current and here a delay ensued. When about 20 minutes had elapsed the people thought that the last bomb had escaped, but near the bridge of the Graces it was located and a fourth detonation announced the complete success of the experiments.

It is represented that Ulivi wished to introduce the greatest difficulties and did not make up the bombs in the usual manner. He had already proved that glass and ebonite are transparent to the "radio-ballistic" rays and employed other insulators. The powder was inclosed in a capsule of gutta-percha and this in fiber, which another portion of the story suggests was waxed cord. Outside there was a sphere of porcelain, this incased in asbestos cardboard, and finally to inclose the whole, a jacket of wrought iron.

The bombs thus constructed could float about two thirds immersed. There is the claim that flotation is not necessary, and that the bombs could have been sunk to the bottom or buried in the earth without changing the results. But for such a public demonstration the safety of the spectators could be better assured by the method adopted.

The distance from the river to Monte Senario, where Ulivi stationed himself, is ten and one-third miles, and intervening are Fiesoli and the plain of the Arno. When the signals were received that the bombs were placed and the admiral ashore again, the engineer began at once to send forth his "spy-rays."

The popular description of the devices employed suggests two operations, the sending forth of the electrical "spy-ray," which diffuse themselves in all directions, and the production of infra-red rays. Other items in the outfit are a telemeter, a wireless apparatus for messages, a voltmeter, an ammeter, and a chronometer. In addition there is a battery which furnishes the energy for the action of the apparatus.

In operating, the "spy-rays" are first sent forth. When they encounter a metallic mass they free from it what may be termed, "return rays." On analysis the latter indicate with some precision to the operator, who has his head incased in a telephone helmet, the amount of metal, its radiomagnetic effect and the distance at which it lies. The operator then directs the infra-red rays which he produces toward the metallic object. As they pass through it they produce scintillations, or as he terms them, "M-rays," which ignite the explosive.

If this story is really true, the possibilities are inconceivable. In offensive warfare Ulivi claims to be able to destroy forts, ships, and magazines, if they contain explosives, and practically eliminate war. On the other hand, if mineral veins or lodes can be thus detected there will be a most useful extension of the arts of peace.

Ulivi, born in Tuscany, achieved distinction at the Technical Institute of Florence, was made laureate in Germany, and established himself in France some years ago, and afterward set up a physical research laboratory at Clichy. In working with the infra-red rays of the spectrum, he discovered strange phenomena that these waves produced at a distance. He found that in a stable, some hundreds of feet from his laboratory, the iron horseshoes produced electrical scintillations when under the influence of the infra-red rays. He referred the phenomenon to comparable ones in the production by one musical instrument of sympathetic tones in another instrument. With this idea of sympathetic vibrations he experimented with light, electricity, magnetism, and heat, and the transformation of one into the other. The outcome of these researches has been the ability to explode charges that are within metallic walls. This explanation, although it is set forth as the presentation of the "fundamental theory," leaves much to be desired in the completeness and relevancy of its statements.—*Scientific American.*

SHOOTING IN THE BRITISH NAVY.—The blue-books dealing with the shooting in the navy during the year 1913, which have recently been issued, are even more puzzling than usual, and it is harder than ever to deduce from them any useful comparison between the practice during the year 1913 and that of previous years. We shall not, therefore, attempt to make any general comparison as we have done on former occasions, and shall content ourselves by giving an abstract of the present reports, which are entitled "Result of Battle Practice in His Majesty's Fleet in 1913," and "Result of Test of Gunlayers with Heavy Guns and Light Quick-Firing Guns in His Majesty's Fleet, 1913."

Taking the first mentioned, we find at the outset that there has been a rearrangement in the returns. The corresponding blue-book of 1912 lumped battleships and battle-cruisers together. The present report divides them up into Class I, "Battleships of Dreadnought and later Classes and Battle-Cruisers"; Class II, "Battleships Prior to Dreadnought Class." During 1913 fifteen battleships of the dreadnought and later classes and battle-cruisers took part in the battle practice. Seven of these vessels were armed with 13.5-inch guns and eight with 12-inch guns. The results they achieved were exceedingly divergent. We may say that the general conditions under which firing took place are given as being "good," "very good," and "excellent," so that it may be taken that there was not any very great difference in the weather or in other atmospheric factors which go to influence the shooting. The variation in the results is therefore all the

more noteworthy. These results—separating the 13.5-inch gun ships from the 12-inch gun ships—are as follows:

Order of merit	13.5-in. Guns	Points
1	King George V	974
2	Princess Royal	786
3	Monarch	766
5	Orion	635
9	Thunderer	506
12	Centurion	457
14	Lion	334

Order of merit	12-in. Guns	Points
4	Dreadnought	651
6	Neptune	590
7	Bellerophon	550
8	Inflexible	512
10	Indomitable	481
11	St. Vincent	464
13	Collingwood	397
15	Vanguard	302

It will be observed that the *King George V's* score is nearly three times that of the *Lion*, while the *Dreadnought's* score is more than twice that of the *Vanguard*. Moreover, the 12-inch gun *Dreadnought* comes fourth in the entire list, while the 13.5-inch gun *Lion* is fourteenth.

In Class II—"Battleships Prior to *Dreadnought* Class"—nineteen ships took part. All these ships had a primary armament of 12-inch guns, the majority having a secondary armament of 6-inch guns, though in some cases there were 9.2 inches, and in a few a combination of 9.2-inch and 6-inch guns. The weather conditions were very varying. They are given as being "excellent," "very good," "good," "unfavorable," "difficult," and "very difficult." It is impossible, therefore, to form a correct estimate of the relative shooting efficiency of the various competing units. We may say, however, that the points scored by the first four vessels were:

Ship	Score	Conditions
King Edward VII	515	Very good
Dominion	477	Good
Commonwealth	430	Very good
Venerable	334	Very good

At the other end of the list come the four vessels given in the following table:

Ship	Points	Conditions
Zealandia	156	Very good
Britannia	142	Good
Hibernia	117	Good
Cornwallis	115	Very difficult

No doubt there may be numerous factors, in addition to the weather, etc., which enter into the matter and which are not disclosed; but it is hard for those without internal information to understand why, for instance, under practically similar conditions, both being classed as "very good," the *King Edward VII* should, on the one hand, return a score of 515 points, while the *Zealandia*, with an exactly similar armament, could only obtain 156 points.

In Class III—"Cruisers"—thirteen ships are mentioned. In this case, though the conditions are all reported as being more or less favorable, comparison is again difficult because of the variation in armament, some of the

vessels having 9.2-inch guns, some 7.5-inch, and some 6-inch. We, however, give the first four and the last four units in the accompanying table:

Order of merit	Ship	Armament	Score	Conditions
1	Roxburgh	4 7.5-in. I; 6 6-in. VII	500	Excellent
2	Achilles	6 9.2-in. X; 4 7.5-in. II	446	Good
3	Monmouth	14 6-in. VII and VIII	443	Good, strong glare
4	Hampshire	4 7.5-in. I; 6 6-in. VII	431	Good
10	Natal	6 9.2-in. X; 4 7.5 in. II	245	Very good
11	Shannon	4 9.2-in. XI; 10 7.5-in. II	179	Very good
12	Donegal	14 6-in. VII and VIII	107	Excellent
13	Argyll	4 7.5-ir. I and 6-in. VII	102	Excellent

Here, again, some curious divergencies will be noticed. The *Achilles* and the *Natal*, with identical armament and with "excellent" and "very good" conditions, scored 446 and 245 respectively. The *Monmouth* and *Donegal*, with similar guns, scored 443 and 107 respectively, notwithstanding that the *Donegal's* conditions were "excellent" and the *Monmouth's* "good," but with a "strong glare." Still more noteworthy is the difference between the shooting of the *Roxburgh*, which heads the list, and the *Argyll*, which ends it. Both vessels are armed in a similar manner and both were operating under "excellent" conditions, yet the score of the *Roxburgh* was nearly five and a half times as big as that of the *Argyll*.

In Class IV—"Light Cruisers"—returns are given from ten vessels. The majority of these are armed either with 4-inch VII or 6-inch XI guns alone, though the *Liverpool* and the *Newcastle* have both types of guns. The scores of the first three and last three vessels are as follows:

Order of merit	Ship	Armament	Score	Conditions
1	Amphion	10 4-in. VII	817	Excellent
2	Chatham	8 6-in. XI	597	Excellent
3	Liverpool	2 6-in. XI; 10 4-in. VII	569	Excellent
8	Active	10 4-in. VII	374	Excellent
9	Weymouth	8 6-in. XI	363	Excellent
10	Southampton	8 6-in. XI	280	Very good

It will be seen that the *Amphion* scored more than twice as much as the *Active*, though both fired under "excellent" conditions and both had the same guns. Similarly, the *Chatham* obtained more than twice as many points as the *Southampton*, though the armament was the same in both vessels, and the only difference was that whereas the conditions were "excellent" in one case, they were "very good" in the other.

A noticeable fact is that the score of the vessel heading the list in each class was considerably in excess of that of the vessel coming next in order of merit. Thus, in Class I the difference was 188 points; in Class II, 38 points; in Class III, 104 points; and in Class IV, 220 points.

The remainder of this blue-book relates chiefly to the firing of the destroyers. We learn that out of nine boats of the "K" class, the *Spitfire* led with 153 points and the *Achates* was last with 66 points. In both cases the conditions were "excellent." Of thirty-nine boats of the "H" and "I" classes, the *Larne* led with 162 points and the *Beaver* was last with 61 points; but whereas the *Larne* had "good" conditions, those of the *Beaver* were "unfavorable." The *Sandfly*, however, which also had "good" conditions, only managed to make one point more than the *Beaver*. Sixteen vessels of the "G" class fired. The *Wolverine* was first with 210 points gained under "excellent" conditions, and the *Renard* second with 144

points—a difference of 66—obtained under "good" conditions. At the other end of the list were the *Scourge* with 76 points and the *Scorpion* with 68 points, the conditions being "excellent" and "good" respectively.

Of the vessels of the "F" class armed with 4-inch guns, the *Nubian*, with 160 points, was first and the *Maori* fifth and last, with 82 points, the conditions in both cases being "excellent." Of the "F" class armed with 12-pounder guns, the *Mohawk* led with 206—conditions "good"—and the *Tartar*, with a score of 95, was fifth and last with "excellent" conditions.

Returns are given from twenty-three boats of the "E" class. The first and second were the *Stour*, with 215, and the *Cherwell*, with 185, and the two last, the *Swale*, with 76, and the *Dee*, with 75, the conditions in all cases being "good." In classes "A," "B," "C," and "D," which are lumped together, there were forty-nine boats. The scores of the first three and last three were as follows:

Order of merit	Boat	Score	Conditions
1	Mermaid	166	Good
2	Osprey	148	Good
3	Flirt	145	Good
47	Kestrel	73	Good
48	Success	67	Unfavorable
49	Peterel	65	Good

In the blue-book giving the results of tests of gunlayers in 1913, we notice, first of all, that whereas in past years there were two blue-books devoted to this purpose, one of these being for heavy guns and the other for light quick-firing guns, this year these two sets of returns have been combined in one book. One of the chief points of interest contained in it is the following table, which compares the years 1910, 1911, 1912, and 1913:

Nature of Gun	In scoring time							
	Rounds fired				Percentage of hits to rounds fired			
	1910	1911	1912	1913	1910	1911	1912	1913
13.5-in. B. L. Mark V	....	....	126	171	.....	.....	58.00	66.66
12-in. B. L. K. E. VII and later	525	560	623	214	48.90	37.30	54.74	51.40
12-in. B. L. before K. E. VII	260	287	141	13	32.30	35.20	35.46	38.46
10-in. B. L. Marks VI and VII	26	30	....	10	23.07	33.33	.....	40.00
9.2-in. two gun turrets	106	66	104	55	50.90	53.03	45.20	41.81
9.2-in. single gun turrets	444	461	427	102	55.60	55.30	55.74	58.82
7.5-in. B. L. Mark II	250	256	251	38	52.00	58.20	52.20	68.42
7.5-in. B. L. Mark I	123	108	116	19	39.80	39.08	36.20	21.05
7.5-in. B. L. Marks III and IV	144	143	....	48	45.10	48.30	.....	54.16
6-in. B. L. Marks XI and XII	250	323	436	225	53.60	49.50	49.77	53.33
6-in. B. L. Marks VII and VIII	2266	3024	2104	604	46.20	49.90	49.65	42.54
4-in. B. L.	681	1153	1412	1863	44.10	42.00	38.50	55.34
6-in. Q. F	1002	934	231	119	63.30	58.60	63.60	51.26
4.7-in. Q. F	579	497	396	328	42.70	40.60	38.60	28.65
4-in. Q. F	896	937	678	285	48.50	47.00	42.04	48.07

It will be observed that in the large majority of cases fewer rounds were fired in 1913 than in either of the three preceding years. The most noteworthy exceptions are the 13.5-inch and the 4-inch breech-loading guns. In both cases there is also an increased percentage of hits to rounds fired over all of the other three years recorded. The percentage of hits to rounds fired was, on the whole, greater than the average. The principal exceptions were the following:

Gun	Percentage of hits to rounds fired		Points below three-year average
	1913	Average of 1910, 1911 and 1912	
9.2-in. two gun turrets	41.81	49.71	7.90
7.5-in. B. L. Mark I	21.05	38.36	17.31
6-in. B. L. Marks VII and VIII	42.54	48.58	6.04
6-in. Q. F.	51.26	61.83	10.57
4.7-in. Q. F	28.65	40.63	11.98

A fewer number of ships took part in the tests than had been the case in the preceding years, the numbers being: 1910, 127; 1911, 134; 1912, 116; and 1913, 67; while only one-third the number of men fired, the numbers being 1522, 1671, 1528, and 528 for the four years respectively. No explanation is given of this.

From the figures given regarding guns smaller than 4-inch quick-firing, we have compiled the following table:

Gun	Percentage of hits to rounds fired		
	Average of years 1910, 1911 and 1912	Figures for 1912	Figures for 1913
12-pdr., 18 cwt., and 14-pdr. Q. F.	58.66	60.17	54.09
12-pdr., 12 cwt. Q. F. and 8 cwt.	50.68	68.78	60.03
6-pdr., and 3-pdr. Q. F	40.94	63.56	39.33
3-pdr., Vickers	54.04	77.82	52.00

It will be seen that though the figure for 12-pounder, 12-cwt. quick-firing, and 8-cwt. guns—60.03—was considerably greater than the average of the figures for 1910, 1911, and 1912, yet with the other guns the 1913 figures were all below the averages of these three years. In no case did the 1913 figures equal those of 1912; but probably the latter may be regarded as phenomenal. They were certainly exceedingly good.—*The Engineer.*

REMARKABLE SHOOTING.—*Four Shots Through the Same Hole.*—Gunlayers' tests are showing a high standard of marksmanship in ships carrying the 13.5-inch gun, says the *Observer.* Some of the shooting has been extraordinary. In one case four successive shots were put through the same hole in the target, and some of the gunners made a hit with every round they fired. This excellent shooting is due to several causes. But after

due allowance has been made for uncannily clever mechanical devices, the outstanding fact remains that our naval gunners are expert to a degree that is most satisfactory to the country, which depends upon their skill for its defence.

BIG PROGRAM FOR SUBMARINES.—Italy is about to put in hand, it is reported, some 24 submarines specially designed for coast defence. The displacement will be 250 tons, the surface speed 13 knots, and all are to be completed before the end of the financial year 1915. Two to three boats will be stationed at each of the following ports: Genoa, Spezia, Porto Ferrajo, Maddalena, Naples, Palermo, Messina, Taranto, Brindisi, Ancona, and Venice. There are further to be built six submarines with a displacement of 700 tons and a speed above water of 18 knots, for ordinary service with the fleet.

THE "GIULIO CESARE'S" GUN TRIALS.—It is reported that the gun trials of the *Giulio Cesare* passed off without a hitch. In all 65 rounds were fired, *i. e.*, five rounds from each 12-inch gun. The after triple turret fired three successive salvos with battle charges, both the twin turrets discharging their guns at the same moment, but, in spite of the enormous concussion, the ship sustained no damage whatever.—*Naval and Military Record.*

THE VALUE OF ABOVE-WATER TORPEDO TUBES.—The location of torpedo-tubes in vessels above the status of torpedo craft is dealt with in a recent number of *Schiffbau*, which refers to an article in the *Moniteur de la Flotte* by a French naval officer who urges a return to above-water tubes in the largest ships. The submerged tube, it is argued, takes up an inordinate amount of space and is very complicated, and all efforts to give it a training motion have hitherto proved impracticable. Ships with such tubes have therefore to wait for a favorable moment to discharge their torpedoes, as this cannot be done until the enemy's ship has reached a certain position, and another defect of the fixed tube system is that it renders impossible the concentration of several tubes on one target. Hence the desirability of returning to the above-water tube on a mounting which will give a wide arc of training. Technical improvements have corrected the tendency of a torpedo to run wide when launched from above-water tubes, and the danger to which the firing ship is exposed by a hostile shell exploding the torpedo before it has been launched is much exaggerated. This peril was serious so long as the ordinary spoon-pattern tube was used, but it diminishes when the tube is placed behind armor and protected against splinters. Formerly there was also some risk of damage from the explosion by gunfire of the torpedo's air chamber, containing air at a pressure of 150 atmospheres, but here, too, the danger has been met by using metal of superior quality, so that a blow which would certainly have exploded the old air-chamber would at most cause a leak in one of the new type. Finally, it is pointed out that great risks are already run by accumulating loaded ammunition in turrets and casemates, where a well-placed shot would cause a disastrous explosion. War, in fact, is one long risk, and the best defence is to hit harder and more quickly than the enemy, but this, as far as the torpedo is concerned, can be done only by employing the above-water tube.

The German paper criticizes the proposal unfavorably, and points out that in those rare cases where above-water tubes have been mounted in modern ships, *e. g.*, in the British scouts and new light cruisers, the arrangement was solely due to considerations of size and weight, which would have been much increased had submerged tubes been fitted. The above-water tube has many grave disadvantages, such as a weakening of the side armor behind which it is mounted, the grave danger of premature detonation by gunfire, and the difficulty of bringing up fresh torpedoes to loading

position. German opinion is decidedly against this form of tube for any vessel above torpedo-boat rank, and every ship launched here in the last 14 years—including the smallest cruisers—has been given a submerged torpedo armament. Not so long ago, in fact, it was reported that one or more tubes in the new destroyers were to be submerged, as their position below-water would add to the steadiness of the gunners and also increase the accuracy of the torpedo itself. Advantage has been taken of reconstruction to remove above-water tubes from old ships and to replace them, as far as possible, by those of submerged pattern. This was done to all the coastal armorclads of the *Siegfried* class. As far as is known, the experimental training tubes fitted to one or two battleships, and from which so much was expected have not given good results, and it is not believed they have been fitted to later ships. That tubes below-water can be given a limited training arc is certain, but the necessary mechanism is so complicated and takes up so much space that it is not in favor.

PECULIARITIES OF GERMAN CONNING-TOWERS.—In the *Deutschland* class the conning-tower is a two storied structure, the upper part, which is intended for the fire-control staff, being protected by 6-inch armor, the lower station by 12-inch plates. So ample is the space inside and so excellent the view it permits that the ships of this class, and of the *Braunschweig* class, are often navigated and worked entirely from the conning-tower, even in normal circumstances, and the occupants are as comfortable as they would be in the charthouse. The position has a high command and is absolutely free from neighboring obstructions. The peep slots give a good view, but are so designed as to exclude splinters as far as possible. The next ships are the four dreadnought of the *Nassau* class, which retain the same general type of tower with improved protection, and no change has been made in later classes down to the *Kaisers*, save that a rangefinder with an armored hood is mounted in the fire-control section of the tower, giving a characteristic appearance to the structure. What has been said of the battleships applies equally to the armored cruisers, from the *Prinz Heinrich* down to the *Seydlitz*, and it is highly probable that the later capital units will be found to have essentially the same form of conning-tower.

Considering the immense importance of providing for the staff a well-placed, commodious, and strongly-protected position from which to handle the ship in action, it is remarkable that the type of conning-tower employed until recently almost everywhere but in the German Navy should have failed so signally to meet these elementary requirements.—*Naval and Military Record.*

GUNS AND ARMOR.—One of the most significant features of present-day warship construction is that, according to all the available information, there are now on the stocks only two capital ships whose primary armament will consist of 12-inch guns. One of these is the small Spanish battleship *Jaime I.*, and the other the German battle-cruiser *Ersatz Hertha;* for, although there is no absolute certainty regarding the equipment of the latter, it is generally believed that her main battery will be identical with that of the *Indomitable*, which went afloat over seven years ago. The recent policy of the powers, both great and small, in the matter of battleship design would seem to indicate that the one-time description of the dreadnought type as a combination of the smallest big gun and the biggest small gun is in need of revision, at any rate so far as the first of these factors is concerned. The thirty-third all-big-gun ship to go afloat, the *Lion*, is armed with 13.5-inch guns; the seventy-first, the *Texas*, carries 14-inch weapons; and the ninety-third, which was the *Queen Elizabeth*, will have eight 15-inch for her principal armament. There is as yet no indication of any intention to advance beyond this caliber, although there have been

occasional rumors as to a 16.25-inch gun said to be under trial with a view to its adoption in the British service, while the story of the famous *Vorwaerts* ship, which was to have mounted 21-inch guns, will no doubt still be remembered. However, the fact that Italy, Germany, and Japan have all decided upon the adoption of the 15-inch gun would seem to pave the way for a further advance in this direction, especially in view of the fact that the dreadnought era has stimulated competition in the design of individual ships to an extent previously unknown.

An examination of the principal characteristics of the ships now under construction or about to be put in hand demonstrates the fact that among those responsible for the administration of the world's fleets opinion is unanimously in favor of the "biggest big gun," an opinion which was shared by the late Vittorio Cuniberti, whose article in the 1912 edition of *Fighting Ships* was a reasoned and powerful argument in support of the 16-inch gun—which, indeed, he had advocated as long ago as 1906 in the same annual. Nevertheless, the fact cannot be ignored that there is a large volume of unofficial opinion which is opposed to the continued increase of calibers, and which regards the 15-inch, 14-inch, and even the 13.5-inch gun as an unnecessary glorification of size as against numbers. In this country Sir Reginald Custance is the acknowledged leader of what may be called the "moderate caliber school," and, although he has so far avoided committing himself to hard and fast suggestions, his preference would appear to lie in the direction of a main battery of 12-inch guns. On the other side of the channel there exists an even more revolutionary school. Messrs. Hugh Rees have recently published a translation of a French work under the title of "The Naval Battle: Studies of the Tactical Factors," by Lieut. A. Baudry, of the French Navy, to which Admiral Custance contributed a commendatory foreword; and, in discussing the functions of the ship in battle, the author expresses the opinion that "the 9.4 gun, mounted in sufficient numbers, and keeping up a ceaseless fire of its omnibus shell, three per gun per minute, is the ideal battle-gun that speaks, growls, thunders from beginning to end, from the opening of fire to victory."

In these and similar statements one hears a sort of distorted echo of Nelson's dictum that "only numbers can annihilate." As a general principle this is sound enough, but it lends itself very easily to misapplication, to which it is particularly liable in connection with the subject of battleship armament. As a mere phrase, "a hail of projectiles" has a great fascination for many minds, to which the comparison between medium calibers and medium (and therefore inferior) ships does not seem to suggest itself. Other things being equal, a hail of projectiles is a great desideratum; the trouble is that the other things cannot possibly be equal. Given two ships of equal displacement, armor, and speed, one armed with 15-inch and the other with 9.4-inch guns, it is obvious that the advantage of numbers will be on the side of the latter; but it is equally clear not only that the heavier guns would score a higher percentage of hits to rounds fired, but also that they would come into effective use long before the 9.4-inch weapons were able to do any material damage to the opposing ship. Lieut. Baudry himself realizes this fact, though he does not follow it through to its logical end. He points out that "perforation is not destruction," and goes on to say: "Let us therefore insist upon having a projectile that not only penetrates before it bursts, but also carries a sufficient quantity of very powerful explosive and bursts with sufficient certainty." It is exactly upon these desiderata that the arguments in favor of the big "big gun" are based. The big gun has a greater range; it is more likely to hit; having hit, it is more likely to penetrate; and having penetrated, it is far more potent to "destroy, burn, and tear the whole compartment that it has entered—men, materiel, weapons, pipes, and wires; destruction, demoralization, disorganization!"

There remains the desirability for striking the exact balance between numbers and individual power; but the principal factor in such a problem must of necessity be the need for getting in the first effective hit. There is, unfortunately, no great volume of evidence available on this point, but it has at any rate been demonstrated that at long ranges the American 14-inch gun is approximately 30 per cent more accurate than the 12-inch. On this ground alone, therefore, nine 14-inch guns are the equals of 12 12-inch, and on top of this advantage the heavier weapons have the further superiority of being more likely to penetrate, of doing considerably more damage if they do penetrate, and possibly, according to the weather conditions, of coming into action earlier. It is conceivable that the advantage of the "single, smashing blow" is by some overrated; but a modern naval engagement will be as much a battle of men and morale as of guns and materiel, and, as Lieut. Baudry brings out very forcibly in his book, morale will begin to decline with the first big hit that is sustained, and when morale begins to disappear there will go in its company discipline, organization, and ability to hit. In the abstract the arguments in favor of the biggest big gun are capable of a "reductio ad absurdum"; but the same is true of those by which the big ship might be supported against the small. There has been a marked tendency in the last two or three years towards the increase of armor thicknesses, but this is probably the result rather than the cause of increased calibers. It is interesting to observe, too, that while both Admiral Custance and Lieut. Baudry disapprove of modern armor practice they also disagree with each other, for, while the former advocates the concentration of armor on the principal gun positions, the French officer declares his belief in uniform protection for all arms (that is, for guns of all calibers), and in the consequent reduction in general thickness thereby entailed. The latter is, of course, consistent with the uniform armament of 9.4-inch guns advocated by the author; but under present conditions of armament the choice is between affording a fairly dependable protection to the vitals and leaving the remainder of the target almost entirely unarmored, and plating the whole area with armor that could not be depended upon for useful service under any average battle conditions. Judged by modern designs, the choice between these alternatives is practically unanimous, but nothing save good can arise from the constant discussion of the principles involved and their application.—*Naval and Military Record.*

NAVIGATION

LESSONS OF THE COLLISION.—The recent sinking of the *Empress of Ireland*, with the accompanying loss of nearly a thousand lives, and the still more terrible disaster two years ago in the loss of the *Titanic*, taken with the accident to the *New York* an dthe still more recent collision of the *Kaiser Wilhelm II* with a coasting steamer in the English Channel, emphasize the fact that collision is now the greatest danger that besets the transatlantic traveler. The next great triumph of invention should be the discovery of some means of making the whereabouts of vessels known to each other during a fog.

The ancient method of warning by the sounding of a fog horn is unworthy of the present advancement of scientific knowledge, and some more efficient warning should be sought with the utmost diligence. The use of whistles in signaling should be carefully investigated with a view to making the signals less confusing. After almost every collision there is now a conflict of testimony as to what signals were sounded and what they meant.

Possible misunderstandings as to "ocean lanes" should be avoided with the greatest circumspection, and the "lanes" themselves might well be made somewhat wider. If all west-bound vessels went on a course, say, three hundred miles from the course traveled by east-bound vessels, the

distance would allow for possible errors due to fog and imperfect reckoning, and the few hours lost would be negligible in this era of extremely fast ships.

Heavy penalties should be visited on captains who fail to observe strictly the "rules of the road" at sea, and renewed vigilance as to lifeboat drill is demanded. Most transatlantic liners are now well provided with lifeboats, but the traveler who observes the perfunctory "boat drill" on some steamships will doubt as to the fate of passengers who might have to intrust their lives to the custodians of boats launched in the darkness following a collision if it flooded the engine rooms and put the electric lights out of commission. Boat drills ought also from time to time to be gone through with at night, passengers receiving due warning in order to prevent alarm. A possible method of providing for more competent lifeboat crews would be the requirement of a certain proportion of men who, if not "able seamen," should be familiar at least with the management of a boat at sea, this fact to be shown by the possession of a government certificate. The human factor cannot be neglected, and any measures that can be taken by the governments of the various countries interested to improve the morale and the training of all who command or man the floating cities of the Atlantic should be instituted, in the interests of humanity.

NEW METHOD OF SIGNALING UNDER WATER.—A test of submarine wireless telephony and telegraphy was successfully made last week between the Boston lightship and steamers moored at different distances. This apparatus was perfected by Prof. Reginald A. Fessenden of the experimental department of the Submarine Signal Company of Boston, and consists in substance partly of what is called an oscillator. This takes the place of the bell of the older forms of the company's signal system and is a metal diaphragm about 24 inches in diameter bolted to a hemispherical metal box, the whole being virtually a huge reproducing disk as of a graphophone. Inside the box is a heavy electromagnet actuated by an alternating current from a dynamo. This current vibrates a copper cylinder back and forth with great force at a speed of 5000 vibrations a minute. With this device it is possible to use the Morse code in telegraphy and also to telephone through the water.—*Marine Journal.*

HOW VESSELS MAY COMMUNICATE WITH EACH OTHER IN A FOG AND AT NIGHT.—To the Editor of the *Scientific American:* Like many others, my mind has dwelt on this fog problem at sea during the last few days. I have been familiar with electrical inventions all my life, and it does seem to me possible to perfect a simple device by which vessels at sea could be made aware of their proximity to each other. As I think it out, this device could be made to give almost exact information as to distance apart, and whether ships are approaching or moving away from each other.

I base my calculations on my attention to the impressions made by light and sound during thunderstorms. I have often sat calculating the distance of the storm center, and measuring its approach and its passing, by the time distance between flash and thunder. A stop-watch started and stopped makes the calculations of distance quite accurate. In the case of the device I have in mind, I would make the wireless dot or dash take the place of the lightning flash. While the lightning flash could not be seen through a fog, the wireless and sound waves would not be affected.

Suppose a whistle, fog horn, or gun so connected with the wireless operator's instrument that the touching of his key would release at exactly the same instant the spark for the wireless instrument and the sound of whistle, horn, or gun. The operator on the other ship would receive the wireless instantly, just as I received the lightning flash, while the sound would follow at the comparatively slow rate of about 1100 feet per second, as the sound of thunder. For every second between the receipt of the

wireless spark and the receipt of the sound the operator would know that there was 1100 feet of space between the vessels. A signal of this kind sent out once every ten seconds would cover a radius of nearly two miles. The velocity of the wind would make a difference not difficult to calculate.

To give exact information as to approach or separation of vessels, the following device could be used. Devise an instrument to be worked like a stock-ticker with traveling ribbon. Arrange that this ribbon shall travel at, say, the rate of one inch per second. Each inch would represent 1100 feet of sound travel. The ribbon could be scaled off to represent shorter distances if necessary. Then arrange a series of dots or dashes to represent on this ribbon the receipt of the wireless waves and sound waves. As vessels approach each other, or as vessels approach wireless land stations, the dots and dashes would indicate the fact by crowding up together on the ribbon. For instance, if the signals were first received at a distance of two miles, the dots or dashes would be about ten inches apart on the ribbon; when a mile apart this distance would be represented by a space of five inches between dots or dashes, and so on. As vessels move away from each other, or from a wireless station on shore, the dots and dashes would thin out on the ribbon. If the vessels were moving in the same direction, alongside, the dots and dashes would remain an equal distance apart. If such an instrument could not be operated by the wireless or sound waves, the wireless operator could easily manipulate it through his own sense of hearing. I believe that the use of this method would enable a vessel in distress to guide a rescuing vessel alongside, no matter how black the night or thick the fog.

Any navigator could send a signal of this character without special apparatus other than the wireless. For instance, the captain could instruct his wireless operator to send a signal the instant the whistle begins to blow. The operator on the other ship could report back the time interval between the receipt of the wireless and receipt of the whistle, which would give the distance separating the ships exactly. The distance could be calculated as so many seconds and fraction of seconds, each second being equivalent to 1100 feet.

I have talked with a number of people on this subject, and the prevailing opinion seems to be that my idea is practicable, and can be worked out. If you think this scheme would stimulate other minds to action in solving the fog problem, I have no objection to your publishing it. It would be far better to have hundreds of minds working on this problem than perhaps only a few.

J. B. WEST.

Syracuse, N. Y. —*Scientific American.*

FOG SIGNALLING AT SEA.—To the Editor of *Engineering.—Sir:* The collision of three Atlantic liners lately makes any suggested means for the prevention of such accidents of interest.

The following received the approval of a well-known board of trade engineer many years ago, but it requires more than that for practical consideration; and I hope that my suggestion through your medium may attract the attention of some foreign government, for it can be so easily tried during a fog on shore, and at so small a cost; and the result, if successful, of so great value that a government less hide-bound than ours may be induced to try it.

I suggest that the siren on board all steamships be made to turn through a certain angle to port and starboard, say 50 degrees. The signals are two blasts to port, then three midships, and four to the extreme starboard angle; and repeated, that an officer on watch hearing a signal would have time to put on his ear-receiver for the repeat signals.

The relative amount of sound heard from the two and four blasts would determine whether the ships were in the danger line or crossing in or out of it; it would give the direction of the position of the other ship and the relative direction in which they were travelling to a close degree.

From experience, a suitably lined ear-receiver is all that would be required to determine very correctly the direction from which the sounds were coming and their comparative intensities. The sirens could be mechanically controlled to give only the determined direction and number of blasts, and that without interfering with the use of the siren ahead. Surely this is worth trying.

Yours obediently,
H. COKE-P.
—*Engineering.*

SOME GREAT MARINE DISASTERS.—A record of the most serious marine disasters since 1850 shows that the list is headed by the sinking of the *Titanic,* when 1595 people were lost. This is followed by the recent loss of the *Empress of Ireland,* the total of whose fatalities is now placed at over 1024. It is estimated that 1000 lives were lost in the burning of the *General Slocum* in the East River, New York, in 1904. In September, 1912, the *Kickermaru* was wrecked off the coast of Japan, with a loss estimated at 1000. In September, 1905, the Japanese warship *Mikasa* sank with a loss of 599. In June, 1894, the *Norge,* wrecked in the North Atlantic, went down with a loss of 600. In September, 1890, a Turkish frigate foundered off Japan with a loss of 540. In August, 1876, the *Great Queensland,* loaded with powder, is supposed to have been blown up in midocean, for she was never heard of again, and 569 perished. In April, 1873, the *Atlantic* of the White Star Line was wrecked off Halifax with a loss of 547.—*Scientific American.*

An instructive accident occurred recently off the American coast. The liner *New York* was, when hove to in a fog, struck by the Hamburg-Amerika liner *Pretoria,* and a hole, reported to be 32 feet long and about 12 feet wide, was ripped in her port side. Luckily it was above the water-line, and the accident therefore led to no disaster. The resemblance to the *Empress of Ireland,* collision cannot escape the reader. The conditions were almost the same, save that the attacking vessel was smaller and that the ill-fated steamer was ripped below instead of above the water-line. The accident is instructive as showing the nature of damage done by a glancing blow, and strongly supports the advocates of the double-skin ship. —*The Engineer.*

ENGINEERING

FRENCH TEST SUBMARINES.—With a view to testing the capabilities of French submarines for action off the enemy's coasts the 550-ton *Brumaire* was last week ordered to accomplish at full speed the run Cherbourg-Calais and back, which was done very satisfactorily, and six other submersibles, also of the *Laubeuf* type, of the Cherbourg station, were sent to sea with the mission to attack the Deuxième Escadre légère in Quiberon Bay, some 300 miles distant. The strain proved too great for the *Germinal,* which returned to Cherbourg under escort of a destroyer. In truth, the reliability and war value of French submarines need not be exaggerated, especially when it is considered the percentage at ordinary times of boats refitting or repairing in dockyards, and so unavailable for sea duties. This fragility of submarine motors is one of the arguments brought in favor of an increase of the number rather than of the size of French projected submarines, as the more powerful the Diesel motors are the more delicate their working. This the Gallic Navy has found out to her cost, every increase in motor power having been accompanied by no end of trouble. The 720-horse-power Diesels of the *Mariotte* had to be completely remade, and the jump to 2400 horse-power in the *Néréide* may prove a costly experiment.—*Naval and Military Record.*

OIL ENGINE TRIALS.—It is reported that the torpedo gun vessel *Lussin* has been experimentally fitted with heavy oil engines for propulsion. She is the first vessel of the Austrian Navy to be equipped with internal combustion machinery, apart, of course, from submarines, although the surface propulsion of the latter is by petroleum motors. The *Lussin* is an old vessel built at Trieste in 1883, and has a displacement of 1011 tons. Originally she was fitted with horizontal compound steam engines of 1830 horsepower, giving a maximum speed of 14 knots, the boilers being of the Dürr pattern. The nature or power of the heavy oil motors which have now been given to her for trial have not been disclosed.

OIL FUEL FOR THE NAVY.—The Admiralty is taking steps in various directions to ensure an uninterrupted supply of oil fuel for naval purposes. During the month a White Book was published in which certain information was given concerning an arrangement entered into with the Anglo-Persian Oil Company, by which the government has undertaken to purchase shares and debentures of this company to the extent of £2,200,000, thereby acquiring a predominating interest in the undertaking. It will, moreover, have a right of veto at board meetings. The quantity of oil which it is proposed to obtain from this source has not been divulged, nor has the price, though the terms agreed upon are regarded as being satisfactory. The government will, saving as above stated, be just a shareholder in the company, reaping, presumably, any benefits which may accrue by way of dividends on its investments. It will, moreover, purchase and pay for what oil it requires just like an ordinary customer. The acquiring of oil from this source has been criticised because, at present at all events, the oil-bearing wells of the company lie many miles inland from the head of the Persian Gulf, which will necessitate the employment of a pipe line running through wild country. It is contended that such a pipe line would be readily attacked and would be very difficult to protect. However, it is safe to assume that this aspect of the matter has been carefully considered. Another quarter of the globe in which the Admiralty is reported to be making special arrangements with a view to acquiring additional supplies of oil is California, but up to the present there has been no official pronouncement on the matter.—*The Engineer.*

SMOKE PREVENTION.—The military importance of using in action only coal of the best quality, and of having boats designed to emit as little smoke as possible, was conclusively illustrated in the course of an encounter which took place recently off Toulon between the Première and Deuxième Escadres and attached flotillas. After steaming on parallel lines for some time and engaging in a hot artillery duel, both sides thought to make a diversion by hurling their destroyers to the attack of the van of the enemy, with the result that black smoke soon covered the battlefield, creating the utmost confusion, and causing friends to fire on one another. This points to the insufficiency of the efforts made during the last few years to improve the quality of the fuel used by the French Navy, which, it is feared, yet retains the record for smoke production, a sort of distinction that might easily lead to grief in war, as it would facilitate the scouting of the enemy while hampering the work of gunners.—*Naval and Military Record.*

THE ELECTRICALLY DRIVEN GYROSCOPE.—Inertia is one of the great influences or natural laws, controlling the universe in which we live. It may be defined as the energy equivalent of change in motion. Energy must be put into matter to change its motion. No change can occur without work to pay for it. On the other hand, as a compensatory principle, work so done must inevitably produce a corresponding change of motion, and such changes of motion, if reversed, release the stored-up energy.

In the gyroscope a relatively large amount of energy is stored up in the rapidly rotating heavy wheel. This energy may be regarded, in a certain

sense, as vector energy, since it is associated with angular momentum about an axis. If now moderate twisting forces are allowed to do work on the gyro about some other axis, the amount of vector energy added with reference to the axis of application will be small compared with that contained with reference to the original axis, and will result in a vector summation which will place the final resultant vector energy at a new axis slightly displaced from the original. The process of shifting the axis, in obedience to the vector summation, is called precession. The precession of the ordinary gyro-top is one of the most fascinatingly amusing phenomena for captivating the interest of old or young observers. The spinning top, as a crude form of gyroscope, has charmed many generations of boys, but only to the last generation has the spinning top revealed its wonderful latent powers of holding a vector axis fixed in space indefinitely regardless of surrounding motion-chaos. A gyro-compass on board a ship is started, say, in Boston, with its axis pointing north. The ship crosses the Atlantic, and for a week jumps and curvets in a bewildering dance of motions to the music of the waves; yet the gyro never swerves from its allegiance to the earth's axis by more than a fraction of a degree.

The ordinary spinning top gives but a glimpse of its latent possibilities in holding a direction because its stock of rotary energy is small and short-lived. It was not until an electric motor was harnessed to a heavy and finely balanced top that the real powers of the gyro in this respect became apparent. The larger the stock of vector rotary energy, the smaller the vector deviation due to casual disturbances. The modern gyro-compass gives far more directive torque than the best magnetic compass and ignores magnetic disturbances and declinations. It points to the true geographical north.

The gyro-horizon gives an artificial true horizontal on the deck of a rolling ship. The gyro-stabilizer helps an aeroplane to hold its direction, or a ship's hull to hold its course, in spite of winds or waves. An interesting description of the Sperry gyro-compass is given in the paper by Mr. H. C. Ford, presented at the Detroit convention of the American Institute of Electrical Engineers. One may confidently expect a large future for the commercial gyro in aeroplanes and on seagoing vessels.—*Electrical World.*

AN ELIHU THOMSON TURBO SHIP-STEADYING PATENT.—Elihu Thomson of Swampscott, Mass., assignor to General Electric Company in patent No. 1,093,159 utilizes the rotating parts of the turbo generator as a great gyroscope to steady the ship and reduce her rolling, the turbo generator having a vertical shaft.—*Scientific American.*

WASTED OIL.—Now that most of the Americans and Europeans have been rescued from the disturbed districts, the most deplorable feature of the conditions existing in Mexico is the amazing waste of oil, of which the British fleet, curiously enough, stands in need. The character of this disaster is reflected by the Washington correspondent of *The Morning Post.* He points out that now that practically all the British and Americans in the Tampico oilfields have left, wealth is running to waste at a prodigious rate. How great this waste is can only be understood when it is stated that one group of wells produce 80,000 barrels a day, and that there are three wells from each of which $3,000,000 (£600,000) worth of oil is flowing daily and saturating the ground. Once an oil well starts flowing there is no way to stop it, and the oil must either be piped from the well into the tanks or it overflows at the surface and runs into the ground. As there are no men to operate the pumping machinery and attend to the proper distribution of the oil in the tanks, it gushes from below and then spreads out over the ground, and at the present time millions of dollars' worth, the property of Englishmen, are being lost. The British Minister at Washington has suggested that the oil districts, some 80 miles long

and about 40 miles broad, should be neutralized in order that the men employed at the wells and tanks may return to work. If this proposal is rejected, it is certain that the British and American Governments are powerless to provide sufficient protection, and the waste will continue. There is great danger that if the flow of oil is permitted to go on unchecked, it will not only thoroughly saturate the ground, but it will run down to the river, and then, either by design or accident, be set on fire. This would make it impossible for ships to come up to Tampico, while the fire could not be put out, and would do incalculable damage, as the wells would be damaged beyond restoration, and the entire district would cease to be oil-producing. The destruction of the Tampico oilfields would be felt everywhere; Tampico produces more oil than the entire United States, and the cutting off of this source of supply would cause a heavy increase in the price of oil and seriously inconvenience every consumer of oil fuel—including the Admiralty.—*Naval and Military Record.*

SPECIAL STEEL IN WARSHIP CONSTRUCTION.—In a paper read before the Japanese Institution of Naval Architects by Commander Hiraga, on "The Use of Special Steel in Warship Construction," the author said that in practical working he found high-tensile steel as good in almost every detail as mild steel, and that it could be bent and joggled with equally good effects. Nickel steel, he thinks, is not quite so good, but good enough so long as its use is restricted to decks and bulkheads as at present. Experimenting on elastic limits he found some uncertainty, but yield-point was more definite. Experimenting on the buckling of columns of lengths varying from 12 to 26 ratio to the diameter, he found high-tensile and nickel-steel 40 per cent stronger than mild steel. The author went on to say that no doubt this advantage gradually decreases with the increase of length of column, and finally all the three materials exert practically the same resistence to buckling when the columns are very long. As shell plates, double-bottom plates, longitudinals, deck plating, combined with planking, etc., may be regarded as columns of moderate length in the matter of resistance to buckling, this extra strength of high tensile steel is a point in its favor. The Yokosuka practice is to drill the rivet-holes or countersink to the full depth of the punched hole in thin plates; to plane all edges both the longitudinal and transverse; drill all large holes, cut out the butt-straps by punching and not by shearing and then to plane. In cases where oxy-acetylene cutting is employed at least ⅛ inch has to be subsequently planed off. Commander Hiraga advocated in using high-tensile steel, a great reduction in scantlings. The author in a joint paper with Lieutenant Hashiguchi on mild steel and special steel rivets, gave some exceedingly interesting results of experiments obtained with rivet-bars, rivets, and riveted joints (single riveted laps) and comparisons of strength resulting from the three principal modes of riveting.—*Shipping Illustrated.*

ELECTRICITY FROM COAL.—According to press reports, Thomas A. Edison is now engaged with the problem of producing electricity directly from coal and declares that it will be accomplished some day. If Edison succeeds in solving this problem, it will be without doubt his greatest contribution to the good of man. It will mean a great economy in coal consumption if he finds a way of converting all or nearly all the stored energy of coal into electricity. Others have tried to do this but so far have succeeded in converting only a small proportion of the energy.—*Scientific American.*

SMOKE PREVENTION BY MEANS OF STEAM JETS.—According to observations recorded by the late Lord Armstrong, steam issuing from an orifice in a boiler is positively charged. Use of this principle for the dispersion of smoke has been the subject of experiments by Mr. G. B. Burnside, of the University of Glasgow, Scotland. In the course of this work aqueous vapor was projected from nozzles placed in the center of a chimney. The

steam in its passage through the nozzles was electrified by friction and also partially condensed. In this way a cloud of aqueous vapor, electrically charged, was obtained in the chimney. Each particle of aqueous vapor acted as a center of attraction around which the soot particles congregated and formed groups, which fell down the chimney by gravity. In an experiment with a large school chimney 220 pounds of soot were collected in one month.—*Electrical World.*

AVIATION

FRENCH AIRSHIPS.—The French Government are shortly having delivered to them two enormous *Astra Torres* airships, both of 23,000 cubic meters capacity, and having four motors of 250 horse-power each. Their speed is something over 63 miles per hour, and, in addition to bomb-dropping tubes and wireless telegraphy, they carry each two Hotchkiss quick-firers. The car has separate cabins for pilots, an engine room, and passenger compartments. We have one small *Astra Torres.—Naval and Military Record.*

THE TRANSATLANTIC AEROPLANE.—The Wanamaker transatlantic aeroplane, *America,* was successfully launched and tested at Hammondsport, N. Y., June 23. This craft was built by Glenn H. Curtiss, and carrying three men and ballast on her trial flights, brought her total weight up to 3500 pounds. When fitted with stores this will be increased to 5000 pounds. —*Marine Journal.*

THE ALL-STEEL AEROPLANE.—It is a curious anomaly that in this age of steel construction such a large amount of wood should be used in the building of aeroplanes. In the sister art of yacht construction wood has been abandoned, except for a few uses, entirely in favor of steel and the high-grade alloys. Why has not a similar substitution been made in the aeroplane, where the demand for weight-saving is scarcely less insistent than it is in the racing yacht?

A few years ago it would have been near the truth to say that this clinging to wood construction was due to conservatism—an unwillingness to change from the familiar to the less familiar. The gliders of the early experimentalists were made of wood and canvas; so was Wilbur Wright's first power-driven machine; and in an art so novel as that of flying, whose votaries, generally speaking, were men possessed of more daring and enthusiasm than they were of technical knowledge, it can readily be understood that there was a disposition to cling to the forms and material, with which Wright made his classic flight at Kitty Hawk.

Wright himself was not free from this prejudice in favor of wood for aeroplane construction. The writer remembers discussing with him at the Belmont Park meeting the subject of the *Scientific American* design for an all-steel racing monoplane. Wright acknowledged that the theory of the metal machine was correct; but turning to the *Baby Wright* machine which was standing nearby, he patted one of the wooden struts and voiced a sentiment which is strong, even to-day among aeroplane builders, by saying: "This is the material for the aeroplane; I know what it can do, and it gives some warning of a failure."

Yet, it is a fact which cannot be disputed, that compared on the score of strength for weight, and of reliability, the steel and other alloys are vastly superior to wood, even for such special requirements as those of the aeroplane.

The main transverse spars in the wings of a monoplane are not subjected to any more complicated and severe stresses than is the mast of a racing yacht. The compression in the spars, due to the pull of the guy wires, finds its counterpart in the compression of the mast due to the pull of the shrouds; and the transverse bending stresses, applied to the spars at the

wing cross-ribs, find their counterpart in the bending stresses on the mast due to the pull of the mast hoops—yet the yacht designer has not hesitated to abandon the wooden mast and the wooden boom and substitute spars built up of steel.

We note that our esteemed contemporary, *The Engineer* of London, which has long been an earnest advocate, like ourselves, of the substitution of metal for wood in aeroplane construction, ascribes the reluctance to make the change largely to the difficulty of obtaining the shapes which are required for the framing, and particularly for the struts, as used in the biplane. There is no doubt that aeroplane construction calls and will ever call for unusual shapes. But it is certain that, as in the case of the automobile, when once the request for shapes of special metal and special form has become general, there will be a lowering in the price due to the increased demand.—*Scientific American.*

AEROPLANE AND BALLOON IN CO-OPERATION.—Some very suggestive observations have recently been submitted concerning co-operation between balloons and aeroplanes, a subject which, to the uninitiated, might seem at first sight to involve retrogression, and not advance, in the science of aeronautics. Since the advent of the aeroplane and the airship the use of the balloon for military purposes has practically ceased, but it is a mistake to suppose that it has on that account been relegated to the limbo of forgotten and obsolete military appliances. As aviators well know, the balloon can still render useful assistance to the new aircraft by which it has been all but entirely superseded. No matter what may be the skill of an aviator he must still rely to some extent on the assistance and co-operation of the meteorological experts, if he is to avoid the dangers with which the navigation of the air is beset. The balloon has, of course, always been used for studying air-currents, certainly long before aeroplanes were brought to their present high degree of perfection, and this brings us to the question of co-operation between balloons and aeroplanes, and the valuable assistance that can be rendered to our military and naval air services by the use of balloons in the further exploration of these currents. The Germans appear to have quickly grasped the importance of co-operation between meteorological department and the air services, and as balloons are already employed in meteorological investigations, there is an evident need for co-ordinating all these services, especially as wireless telegraphy is now available to facilitate communications. We suggest that to the chain of seaplane stations on our coasts, and the wireless installations with which this country is ringed round, should now be added an active balloon corps for the purpose of studying air-currents, the whole co-operation with the meteorological department or branches established at convenient centers.—*United Service Gazette.*

VALUABLE DATA FOR THE AEROPLANE BUILDER.—There can be no doubt that the excellent progress which is being made in Great Britain in practical aeronautics is in great measure due to the experimental work which has been done at the National Physical Laboratory for the Advisory Committee for Aeronautics. The extent and detail of the work of the committee may be judged from its fourth annual report, which contains more than four hundred pages, and embodies no less than twenty-eight separate reports. Limitations of space prevent any elaborate review of this work, and we shall merely attempt, here, to sum up the more important findings.

From the report on experiments with models of aeroplane wings we learn that good results will be secured by placing the maximum ordinate of the wing section farther from the front edge than is the present practice. Furthermore, so far as the aerodynamics of the wings are concerned, there is nothing to be gained by thickening the leading edge, although there is no particular disadvantage if the edge is moderately thickened. Of considerable constructional advantage is the fact that a distinct increase may

be made in the thickness of the after portion of the wing, without incurring any aerodynamical disadvantage. The value of this fact is that transverse spars of deeper section than are commonly used may be inserted toward the trailing edge of the wing. On the question as to how far results obtained with models may be applied to full-size wings, we learn that the lift-drift ratios of models should be increased from 15 to 20 per cent to make them reliably applicable to full-size wings.

A question which has attracted much attention of late years is that of the value of reflexing the trailing edge of the wings, and it has been established that to restrict or entirely prevent the movement of the center of pressure, when there is a change in the angle of incidence, it is necessary to reverse the curvature in the after portion of the wings. The laboratory tests have shown that absolutely to prevent the movement of the center of pressure in this way, about 12 per cent of the maximum lift-drift ratio must be sacrificed, and of the maximum lift coefficient about 25 per cent.

The report on the distribution of pressure over the surface of the wings brings out the fact that the tips of the wings have a very low aerodynamic efficiency. Good results, according to the report, should follow a careful investigation into the effect of variations of camber, angle of incidence, and plan form in that portion of the wings at and near the tips.

The report dealing with wind forces and moments shows that great accuracy is necessary in giving the struts symmetrical form. If they are not symmetrical, highly unsymmetrical and erratic cross-wind forces will be produced by the struts when the aeroplane yaws from its path. If the struts have a large ratio of fineness, irregularities of construction will have a small effect on the drift and the transverse wind forces. Should the ratio be less than 2½ to 1, the drift will be extremely high, and the transverse wind force will be erratic in its magnitude.

The tests on model aeroplane bodies show that good results are to be expected from giving careful attention to the design of the body. To many aeroplane builders it will be a surprise to learn that, in place of the symmetrical torpedo body form, better results are to be expected if a single boom is extended from the cockpit to the tail planes and elevators.

Tests on a model tail plane and elevator planes prove that the maximum control is reached when the elevators are turned to an angle of 30 degrees, above or below the horizontal; furthermore, the elevating or depressing moments are about proportional to the angle of depression or elevation, until the above-mentioned limiting angle of 30 degrees plus or minus is reached.

Of widespread interest will be the results obtained in the investigations of the gyroscopic action of the engine and propeller. If an aeroplane driven by a 100 horse-power Gnôme engine coupled to a 9-foot 6-inch, 2-bladed, 30-pound propeller, is caused to make a complete turn in 20 seconds, the total gyroscopic couple is found to amount to 324 foot-pounds; and a sudden manipulation of the elevator to an extent just sufficient to raise the pilot from his seat, was found to be 330 foot-pounds. According to the report, these couples are not of serious amount and they can readily be met by the ordinary controls. They act upon the aeroplane in much the same way as a gust of wind; but there is the advantage that both the magnitude and the direction of the gyroscopic couples are known and the pilot is prepared for them.

The report on model propellers endorses the present method of design in determining their section, etc. Under the present method each section of the blade is considered as a small aerofoil, and is designed accordingly. The report shows that the method is not strictly correct, and that the calculated thrust, torque, and efficiency are slightly less than that obtained by the accepted method. The laboratory experiments proved that a certain type of propeller should have had a maximum efficiency when the angle of attack was 4 degrees. This efficiency, however, was not reached until the angle had been raised to 9 degrees.—*Scientific American.*

"L 3" GERMAN DIRIGIBLE.—Having successfully completed its trial endurance flight from Friedrichshafen to the Johannistal aerodrome, near Berlin, the new naval dirigible airship *L 3* has been taken over by the authorities, and the German Navy is once more in possession of a great air cruiser. From accounts in the press the *L 3* is evidently much larger and in every respect more efficient than the previous two naval airships which successively came to grief. On the flight from Friedrichshafen it was in the air no less than 36 hours, with the motors running the whole time. Good weather seems to have been met with throughout. The vessel was sighted at points as widely separated as Metz, Heligoland, and Stettin, and a glance at the map will show the great distance that was covered. *L 3* is manned by a detachment of officers and men who have been training for this service at Fuhlsbüttel, near Hamburg, with a couple of airships chartered from private companies. A second dirigible will be delivered in the next month or so, but this will be of the *Schütte-Lanz* type, which has given such good results in the army air service. The papers state that each naval airship is to be armed with one small quickfirer and two machine-guns, besides launching tubes for explosive bombs.

Some details have been published of target practice carried out from an army airship recently. The target was a box suspended from the car of a captive balloon, while the firing airship maneuvered at an average range of 2000 meters, and managed to get in a number of hits with its quick-firing gun. When the machine-guns were brought into action the target was quickly riddled. A high wind prevailed at the time, causing the target to sway violently in every direction, thus imposing an extremely difficult task on the airship's gunners. This experiment is held to have proved that the big dirigible provides a wonderfully steady gun-platform, and as the development of special airship ordnance proceeds there is no reason why aerial gunnery should not become as accurate as that from a warship. Firing from a great height shells with a powerful high-explosive burster, a dirigible ought to be able to inflict severe damage on men-of-war, which could offer no effective resistance to a plunging fire of this description. Such at least is the theory held here, where enthusiasm for the airship as an instrument of naval warfare is greater than ever it was. Another lesson of the gunnery experiments referred to was the probable impotence of the most efficient aeroplane when it encounters a hostile airship. Hitherto there has been a widely-held belief that the largest and fastest dirigible would fall an easy prey to several armed aeroplanes, but this view receives absolutely no support from German experiments which, on the contrary, have tended to demonstrate that all the machines would be disabled by shells and machine-gun bullets before they got near enough to make accurate shooting with their own armament.

No special emphasis need be laid on the undoubted ability of these German airships to make dynamite raids on the enemy's dockyards and magazines. It is not necessary to be an alarmist to realize that such raids would certainly be attempted in war. Whether there is any effective means of defence against this form of attack can be decided only by experts with first-hand knowledge of the fighting efficiency of aeroplanes. German authorities consider it not merely probable but virtually certain that their airships could lay in ruins a foreign dockyard and return unscathed through a cordon of defending aeroplanes, while the effect of high angle fire from the ground is discounted. It goes without saying that the raid proper would be delivered after nightfall, *i. e.*, under conditions that would badly handicap the defence, whether this consisted of armed aeroplanes or high-angle guns, or both.—*Naval and Military Record.*

GERMANY'S DIRIGIBLE EQUIPMENT.—According to the *Kölnische Volkszeitung*, Germany has at the present time 24 dirigible stations with 29 fixed and four mobile hangars. In addition, eight hangars are in course of construction, and should be completed by the 1st October next at latest.

Fourteen of the fixed hangars are of iron, 11 of wood, three of iron and wood, and one of concrete. About half of these hangars are shut by means of sliding doors. The system for closing adopted for the others are swing doors, screens, and a combination of screens and sliding doors. The Military Administration posseses nine hangars, viz.: one at each of the following towns: Cologne, Königsberg, Liegnitz, Metz, and Strasbourg, and four at Tegel. The eight hangars in course of construction belong too to the Military Administration, and are at Cuxhaven, Aix-la-Chapelle, Allenstein, Graudenz, Hanover, Lahr, Posen, and Schneidermuhl.

The stations of Biesdorf, Bitterfeld, Brunswick, Cologne-Nippes, Dresden, Dusseldorf, Frankfort-on-Main, Friedrichshaven, Hambourg, Gotha, Johannisthal, Kiel, Leichlengen, Leipzig, Manzell, Baden-Oos, Potsdam, Mannheim-Rheinau, and Wanne belong partly to private societies and partly to the district communal administrations.

THE HYDRO-AEROPLANE AT VERA CRUZ.—Capt. Washington I. Chambers, U. S. N., in a lecture to the members of the University Club of Washington, stated that the hydro-aeroplanes had proved their usefulness in military operations around Vera Cruz and elsewhere. Particularly had they shown their value in ascertaining whether or not harbors were mined. The captain stated that not only is it possible to see mines plainly, but they can be easily photographed from the aeroplane. Recently, mines were planted on the Pacific coast and the commander of the Pacific fleet was notified to that effect. The aeroplanes were sent out to search for them, the aeronauts having no information as to the vicinity in which they could be found. Nevertheless, they had no difficulty in locating the mines.—*Scientific American.*

Experiments with aeroplanes and grenades have been carried out by the Royal Flying Corps at Aldershot, in the vicinity of Jubilee Hill, Long Valley. The grenades were fastened to steel rods, which were inserted in the barrel of an ordinary rifle, and fired by the rifleman with the gun at his shoulder.—*The Engineer.*

BOMB THROWING.—The report having gained currency abroad that the latest plan of the bomb-throwing aviators in war will be to drop explosives down the funnels of warships, Major H. Bannerman-Phillips, the British aeronautical authority, thus disposes of it in the *United Service Magazine* of London: "Even from an almost stationary hovering airship the funnel of a warship would probably be missed many times in succession before a lucky bomb got down its open throat, and in the mean while 300 feet is rather close quarters for an airship at which to keep stationary, and the crew and engine car could be riddled with rifle bullets from the warship, while surely at that range the anti-airship guns with which all navies will be equipped would make short work of the overhead attacker in less than a minute, since there would be no delay in getting the range. In any case the funnels of warships are capable of protection by domed shields of some kind, from which the dropped projectile would glance off" *—*Army and Naval Journal.*

DETERIORATION.—In a paper read before the Aeronautical Society of Great Britain Lieut. Col. F. H. Sykes says: "Some aeroplanes deteriorate more rapidly than others by being out in the open, but there is no doubt that they all deteriorate to a very considerable extent, and if the climate is damp or otherwise unfavorable new planes will be required after each period of maneuvers. More attention to varnishing the wood and exposed metal would probably well repay time given. A really good water-proofing 'dope' is a want. An entirely efficient very light portable tent is still lacking. If the ideal in this respect is obtained considerable expense and

* See references to current publications, page 1263.

deterioration of aircraft might be obviated by at once sending the tent shed to the breakdown instead of having to go through the laborious process of dismantling the broken-down machine, loading it on a lorry, and bringing it in."—*The Engineer.*

DEFENCE FROM AIRSHIP ATTACK.—With proper gunfire on the earth, aircraft should be kept at such a height that it would be impossible for them to drop any projectiles that would have more than a mere chance of hitting the target. Not only will the modern high-power rifle avail to keep airships so high that whatever hits they make on the earth will be by pure luck, but when the artillery designed for attack on aerial craft is taken into consideration, it can be seen what great risks aviators run in getting too near the earth. The position of the aviator is one of such precariousness that he may be trusted to keep farther away from possible injury by bullets or shells than would a scout or an artillerist on the ground, for the persons on the earth, even if their vehicle is damaged, may reasonably hope to escape death, but the aviator, if his machine crumples under him, is sure to be dashed to death.—*Army and Navy Journal.*

AUSTRIAN AIRMEN RASH.—Vienna, June 20.—The loss of the dirigible and aeroplane during the army maneuvers to-day is a great catastrophe for Austria's military flying corps, which is struggling under grave difficulties owing to the inferiority of the Austrian balloon and aeroplane industries, resulting in frequent mishaps.

The present disaster is due directly to Austria's fear of Russian and Italian dirigibles in the event of war.—*New York Times.*

REGULATIONS FOR THE ROUND THE WORLD FLIGHT.—Regulations governing the round the world aerial race of the Panama-Pacific International Exposition have been submitted to the Aero Club of America.

The race, for which $150,000 will be awarded as prizes, will start from the Panama-Pacific Exposition grounds in San Francisco on May 15, 1915. It must be completed before noon of December 4, 1915. Licensed pilots of any country may compete and any kind of aircraft may be used. The entries will be received between November 1 of this year and May 9 of next year. An entrance fee of $500 must accompany each entry.

All competitors must pass over the course in an easterly direction, and controls will be designated by the exposition authorities, at which each competitor must alight in the order named. Each flier will submit his log book and instruments to the officials in charge of each control. Each competitor may follow any route he chooses from one control to the next, but supply stations and patrol service will be provided along only one route, the one considered most feasible.

The distance between two controls must be traversed in the same aircraft. A stop may be made anywhere, however, for repairs, even to the extent of installing new motors, and at any control the competitor may abandon the machine he has been using and go on with another one, if it be of the same class of aircraft as that in which he started the race.

Of the $150,000 prize money, $100,000 is to go to the flier finishing first, $30,000 to the second, and $20,000 to the third, provided the flight is made within 121 days. If the first flier fails to make his way around the world within 121 days, but does it on or before December 4, the first prize will be reduced $1000 a day for each day more than the 121 required to finish. Reductions are to be made from the second prize at the rate of $300 a day, and from the third prize at $200 a day.

If none succeeds in the flight, but one or more do it all except across the Atlantic and Pacific oceans, or any other body of water, there will be a reduction of $20 from the first prize for each nautical mile not traversed; $6 from the second prize; and $4 from the third. These deductions will be in addition to those for time over 121 days.

Arrangements are made for third, fourth, fifth, sixth, and seventh prizes in case the deductions from the first, second and third prizes make them possible. No prize shall be paid to any one who does not finish the race before December 4. Fliers may carry aids or passengers and may change them *en route*, but the pilot of record must be in control at all starts and alightings.—*Scientific American.*

THE DEVELOPMENT OF AVIATION IN GERMANY.—Translated from *Aerophile* by Lieutenant (J. G.) R. C. Saufley, U. S. Navy.—For a long time—too long in fact—we have believed in France that the Germans were occupying themselves only with dirigibles and were completely disinterested in aviation. The recent achievements of Ingold, of Stoeffler, and of Thelan have made it necessary for us to change our mind and to turn our attention to the considerable development of German aviation—a development that has been greatly accentuated during the second semester of 1913.

We must recognize to-day that the Germans, though late comers into the domain of aviation, have, since they understood the military possibilities of the use of this new engine of war, set themselves to the task without relaxation, with the method and the discipline that form the basis of their character, and are exerting themselves to adapt this new instrument to the purpose it will have to fulfill.

There are those, however, who, in spite of the convincing results, are unwilling to yield and who deny the incontestible progress made by the Germans in the field of aviation.

It is this erroneous opinion which we would refute; proof in hand, for we do not believe that such an idea should be allowed to stand accredited in the public mind—an idea which goes to stimulate the Germans to equal us.

To be convinced it is only necessary to throw a retrospective glance upon the development of German aviation.

At the Imperial Maneuvers, 1911, one could scarcely assemble eight aeroplanes; on one hand there were four biplanes, *Albatross*, on the other, four monoplanes, *Taube*. In 1912, eight squadrons of eight aeroplanes each participated at the Imperial Maneuvers, and yet Germany never called out all at her disposal.

At the end of 1912, the number of brevets delivered by the German Aero Club was 230; at the end of 1913, it was more than 600, that is to say, the number of pilots was almost tripled in one year.

At the close of 1912, the number of firms engaged in building aeroplanes was twenty; at the end of 1913 there were fifty.

The statistics of the aerodrome of Johannisthal suffice, in themselves, to give a complete idea of the development of German aviation, and yet the figures obtained for 1912 and 1913 are too small, on account of the rapid increase of aerodromes for the last year. If an exact comparison is desired, it would be necessary to multiply the figures of the 1912 column by 1.5 and those of 1913 by 2.3, the number of aerodromes having increased in these proportions.

Days of flight	1911	1912	1913
Days of flight	289	317	365
Number of pilots	134	213	363
Number of flights	7,489	17,651	36,817
Total duration of flights	$821^h\ 41^m$	$1,966^h\ 3^m$	$4,096^h\ 48^m$
Brevets delivered	47	98	172
Number of pilots having made cross-country flights	45	84	212
Miles made good estimating 45 miles per hour, speed 1911, 50 miles per hour, 1912 and 1913	32,563	97,516	209,211
Number of flights per day	26	56	110
Mean duration of flights	65^m	67^m	67^m

Causes of this Development.—At the beginning of 1912, aviation was completely organized in France; it scarcely existed in Germany. Confronted by this state of affairs, German opinion woke up and was disturbed. It had a fear of seeing our aeroplanes in time of war fly freely over German territory. It was necessary that Germany, cost what it may, should regain the lost time.

The National Aerial League of Germany took the initiative with a subscription which was very popular and in a few months raised 7,234,506 marks ($1,808,626), while in France a national subscription, started at the same time, raised only 4,906,320 francs ($981,264).

The Germans, in the utilization of the sums thus collected demonstrated the qualities of order, method and foresight that are characteristic of their race. They drew up a plan for the use of the money and conformed to it.

The problem, as it presented itself to them, may be condensed in the following:

1st. To form, with the shortest possible delay, the greatest number of pilots available for the army and navy.

2d. To encourage the aeroplane industry.

The first principle laid down by the National Aerial League was that only those aviators who were awarded with the brevet of military pilot should be considered as eligible for service in the army and navy. This principle, in Germany, tends uniquely to the increase in number of military pilots.

But, how to select them from the crowd that would present itself to the director and ask for the means and method of acquiring the brevet? Would it be necessary to submit candidates to examination according to the recommendation of athletic societies? By so doing there would often be a waste of money upon an applicant who lacked the requisite qualities.

The aeroplane firms are left free to choose for themselves the pupils whom they prepare for military brevet and are paid 8000 marks ($2000) for each military pilot so trained.

Every firm, with the machine upon which it has passed three ordinary brevets before April 1, 1913, may instruct five pupils during each of the two following periods:

1st period of training (April 1, 1913, to September 30, 1913).

2d period of formation (October 1, 1913, to March 31, 1914).

This rule favors the increase in the number of pilots and the development of the aeroplane industry in Germany. In reality, a firm will choose its pupils with care, since it pays for their instruction. On the other hand it is assured the receipt of $20,000 per year.

But to have a great number of pilots and to encourage the aeroplane industry is not sufficient. It is necessary to have pilots trained to flights of long duration, pilots who fly in all kinds of weather, as they would do in time of war. It is therefore necessary that German houses furnish machines capable of the above achievements.

How to obtain this result? Will Germany imitate France and award several "Grand Prix" to the aviators who, before certain fixed dates, will have accomplished certain performances? This procedure offers a double inconvenience. It encourages only those already proficient and the efforts which it excites will not be continued; such efforts will not ordinarily be produced until a short time before the maturity of the meet. This method, cannot, therefore, suit Germany. What Germany wants, above all, for 1913, is a good average of excellent pilots; she is not yet looking only for virtuosos. She will encourage those destined to this career and who show, in a minimum of time, that they are capable of rendering some service. She wants the efforts to be continued. Also, she will offer only the reward which will be acquired immediately by the pilots who have surpassed previous records.

The director of the comité has therefore instituted a system of premiums for flights of an hour and of monthly pay:

Each pilot who has accomplished a flight, without stop, of one hour, receives a reward of 1000 marks ($250).

If he makes this flight outside of an aerodrome and accompanied by a passenger, he receives a supplementary premium of 500 marks ($125). The same premiums are paid for each additional hour of flight.

For flights of more than six hours, a monthly pay of 2000 marks ($500) is awarded to the pilot who has made the flight of the longest duration without coming down—and this pay to continue as long as he holds the record.

The pilot who in 24 hours shall have made good the greatest distance, even if he has stopped during the course of the flight, receives also a monthly salary of 3000 marks ($750) until his record is beaten, provided the distance made good in 24 hours be greater than 660 kilometers (409.2 miles).

As a result of these encouragements, the following performances have been accomplished in Germany, up to December 10, 1913:

307	pilots	have	flown	1 hour.
157	"	"	"	2 hours.
50	"	"	"	3 "
28	"	"	"	5 "
14	"	"	"	6 "
2	"	"	"	8 "
1	pilot	has	"	9 "

February 10, 1914, in spite of bad weather which did not cease during December and January, the preceding figures were replaced by the following:

369	pilots	flew	1	hour,	increase of	20%	in	two	months.
203	"	"	2	hours,	" "	29%	"	"	"
122	"	"	3	"	" "	41%	"	"	"
73	"	"	4	"	" "	45%	"	"	"
42	"	"	5	"	" "	50%	"	"	"
23	"	"	6	"	" "	62%	"	"	"
10	"	"	7	"	" "	250%	"	"	"
6	"	"	8	"	" "	300%	"	"	"
3	"	"	9	"	" "	300%	"	"	"

2 accomplished flights of 10 to 16 hours.

The statistics of flights, made for the acquirement of monthly pay, attached to the records of duration and of distance, would indicate the same progress in the last few months. This progress is due, and the Germans themselves recognize it, to the director of the National Aerial League and the skillful way he has encouraged aviation and builders.

RAOUL VOLENS.

RADIO

EXPLODING MINES BY WIRELESS.—In some experiments conducted at Leghorn, Italy, to show the practicability of setting off mines by "wireless," the control apparatus was placed in a small building in a park about 2500 feet from the two mines to be exploded. These mines themselves were submerged in the sea about 450 feet from the shore and from 50 feet to 100 feet apart. Mr. Manrico Compare, inventor of the control device used, exploded the mines separately with an intervening period of about two seconds. Raised ground, trees, stone fences and buildings obstructed the space between the firing apparatus and the mines, while several wireless stations were in close proximity, but the experiments proved that the destination of the waves could be fixed without interference.—*Electrical World.*

PROPAGATION OF WIRELESS WAVES DURING SOLAR ECLIPSE.—The eclipse of the sun, August 21, 1914, is expected to present an exceptional opportunity for the study of the propagation of electric waves through air in sunlight and in darkness and across the boundaries of illuminated and unilluminated regions. The eclipse will be total along a strip extending from Greenland across Norway, Sweden, Russia and Persia to the mouths of the Indus. In Russia the duration of totality will be a little more than two minutes.

As pointed out by the committee for radio-telegraphic investigation of the British Association for the Advancement of Science, there are two main points calling for investigation during the eclipse. In the first place, the propagation of signal-bearing waves through air in the umbra and penumbra will probably obey laws different as regards absorption and refraction from those obeyed in illuminated air. In the second place, the strength, frequency and character of natural electric waves and of atmospheric discharges may vary. The variations may occur either because the propagation of natural waves from distant sources is facilitated or impeded by the eclipse or, possibly, because the production of natural electric waves or atmospheric discharges is for some unknown reason affected by the eclipse.

These points have previously been investigated to only a slight extent. The observers of signals during the solar eclipse of April 17, 1912, nearly all agreed that the strength of the signals was greater during the eclipse than an hour before or after. There was only one special observation of strays during the same eclipse, when very pronounced and remarkable variations were recorded during the passage of the shadowcone across Europe.

To investigate the propagation of signals across the umbra it will be necessary to arrange for wireless-telegraph stations on either side of the central line of the eclipse to transmit signals at intervals while the umbra passes between them. This transit of the umbra occupies about two minutes. It is thus very desirable that the Scandinavian and Russian stations should transmit frequently throughout several minutes before, during and after totality. Stations other than those favored by their proximity to the central line should endeavor to keep a complete record of the variations of signals during the eclipse. Stations in eastern Canada and the United States will probably be affected by the penumbra in the early morning. At Montreal the eclipse (partial) is at its greatest phase at 5.52 a. m. standard time. It is possible that the eclipse may have some influence even when it is invisible.

The investigation of strays is of as great interest as that of signals. So far as is yet known, the natural electric waves reaching wireless-telegraph stations in latitudes higher than 50 deg. appear to travel mostly from the south.

The committee of the British Association will prepare special forms for the collection of data on signals and strays during the eclipse, besides formulating a program of co-operative investigation for stations near the line of totality. Results of this study will afterward be published. Those having the facilities to co-operate in the observations are asked to communicate with the secretary of the committee, Dr. W. Eccles, University College, London, W. C. England.—*Electrical World.*

WIRELESS IN THE SOUTH ORKNEYS.—According to the *Geographical Journal*, there is now wireless telegraphic service from the South Orkneys, through the South Shetlands, to the Falkland Islands, and thence to the rest of the world. The South Orkneys, on the verge of the Antarctic, are the site of what has hitherto been the most isolated meteorological station in the world, an important outpost of the Argentine meteorological service. The linking of this station with the world by wireless will be as notable an event as was the recent inauguration of daily wireless weather reports from Spitzbergen, in the Arctic.

WIRELESS TELEPHONY.—According to the *Electrical Review*, further progress has been made by the French naval officers, Commander Colin and Lieutenant Jeance, who have been carrying on experiments in wireless telephony for the past five years. Conversations have been very successfully and efficiently carried on over a distance of 150 miles. It is understood that the inventors have succeeded in developing a transmitter which can be depended upon to maintain constancy of pitch, enabling accurate tuning to be effected. The apparatus is made by the Compagnie Générale de Radio-télégraphie.

CANALS

The first passage through the Gatun locks of the Panama Canal by an ocean liner was successfully carried out June 8, by the Panama Railroad steamship *Allianca*, a vessel of 4000 tons. The trip was made a test of the working of the electric towing locomotives in handling a large vessel. The operation passed off without any incident, the time required being about an hour and a half each way. Governor Goethals was present.—*Nautical Gazette.*

PANAMA CANAL INFLUENCE ON TRADE.—As the influence on trade of the Panama Canal may indicate along what line may be expected the development of American merchant ships, which in the event of war could be used as auxiliaries for the U. S. Navy, naval men should take a special interest in the forecast by O. P. Austin of the probable effect of the Canal on the commercial geography of the world. He says that via Panama New York and New Orleans will be so much nearer than Liverpool to all of western America that it may be expected that an increasing share of the trade of that section will fall to the lot of eastern North America, and that the eastern ports of the United States will be considerably nearer to Yokohama, Melbourne, Sydney and Wellington than is Liverpool by her shortest route, but Liverpool will be still nearer Hong Kong and Manila than either New York or New Orleans via Panama. While we may fairly look for decided advantages in trade with western America, Mr. Austin believes we are not justified in expecting marked changes in the share we shall get of any part of the Orient, except that with Japan, Australia and New Zealand. There should be a marked change in the effect upon the movements of merchandise between the eastern and western sections of the United States. The water rates now between New York and San Francisco, even with the handicap of transferring to the Panama or Tehuantepec railways and retransferring to steamer, are from twenty to sixty per cent of those charged by the railroads, and about one-third of this present water rate is paid for transferring across the Isthmus. It seems probable, therefore, says Mr. Austin in the *National Geographic Magazine*, that with shorter distances and lower rates the Panama Canal will carry most of the freight passing between the eastern coast of the United States and the western coast of Latin-America and that this trade will be greatly increased. The Canal will sufficiently shorten the distances to Japan, northern China, Australia and New Zealand to increase steamship service and materially augment the traffic with those countries, and the European countries will use the Canal in most of their traffic with western America, and in exceptional instances with northern Asia, Australia and New Zealand.—*Army and Navy Journal.*

UNIVERSAL USE OF ELECTRICITY ON THE PANAMA CANAL.—With the electrification of the Panama Railroad, which is being seriously considered, electrical operation on the Isthmus will be practically complete. That our government realizes how important are the electrical features of the Canal is evidenced by the recent appointment in the permanent Canal control organization of an electrical engineer who is subordinate only to the governor of the Canal and the engineer of maintenance.

There is the 6000-kilowatt hydroelectric plant at Gatun, operating on a 77-foot head and at its maximum demand requiring but 7 per cent of the minimum water available. The only unusual feature in the design of this plant is the location of an emergency exciter on the main shaft of the turbo-generators between the turbine and the generator. Ordinarily motor-driven exciters are used. Supplementing this power house is a steam reserve station with four units aggregating 6000 kilowatts at Miraflores, and the steam-electric construction plant at Gatun. There is a high-tension line distributing 44,000-volt energy to four substations near the greatest centers of load—at Gatun (Atlantic locks), Miraflores (Pacific locks), Cristobal and Balboa. The load at the two last-named places is largely made up of machinery operating on the wharves, shops, dry docks, etc. Fearing that induction would disturb communication, all telegraph and telephone circuits were placed underground.

Although the hydroelectric station, upon which dependence is placed, is rated at but 6000 kilowatts, the connected load is approximately 20,000 horse-power, motors ranging in size from 75 horse-power to fractions of a horse-power. Two hundred and fifty miles of lead-covered cable were used in making these installations.—*Electrical World.*

SUEZ CANAL DRAFT INCREASE.—It is officially announced that from and after January 1, 1915, the maximum draft of water allowed to ships going through the Suez Canal, which is at present 29 feet, will be increased to 30 feet.—*The Engineer.*

THE KAISER OPENS TWO CANALS.—The Hohenzollern Canal, opened on June 17 by the German Emperor, and which joins the rivers Oder and Spree, brings Berlin, the German capital, into water communication with Stettin and the Baltic Sea, 150 miles away. The completion of this canal, the history of which dates back to 1669, marks an epoch in the development of German inland waterways that radiate in every direction and solve the problem of cheap transportation in Germany. Vessels of 600 tons and under are now able to come to Berlin from the Baltic Sea, thus effecting a saving of more than 50 per cent in freight rates as compared with the railroads. A second canal was also opened by the Kaiser on June 24, namely, the reconstructed Kiel Canal, which has been accomplished at a cost of $55,000,000. This waterway was first opened in 1895, but enlargement of it was begun in 1907, so as to permit the biggest battleships to pass through its entire length from the North to the Baltic Sea. The bed has been widened from 60 to 130 feet and the surface width from 130 to 350 feet.—*Marine Journal.*

MISCELLANEOUS

SUGGESTIONS FOR IMPROVING OUR MERCHANT MARINE PERSONNEL.—The following excerpts are taken from an article by Commander E. H. Tillman, U. S. N. (retired), appearing in the June issue of the *Navy:*

"A large number of the annual wrecks are due to the incompetency of the officers, their lack of knowledge of the principles and practice of navigation, and to unreliable and inefficient deck hands. A deck lookout may go to sleep, and when caught, what is his punishment? The master has to-day no power to punish such offender as he should be punished; he can, discharge him and then perhaps get even a worse one in his place. We read of vessels being *run, not driven by stress of weather,* upon rocks and shoals and wrecked, when by slowing down, making a proper use of the lead, and a knowledge of the currents, loss of the vessel should have been easily avoided. Many of our merchant officers can work navigation only by thumb rules, having never studied trigonometry sufficiently to understand the mathematical science upon which computations in navigation are based.

"On many vessels the captain is frequently kept on the bridge until almost exhausted because he is afraid to trust the safety of the vessel to his mates. His mates consequently do not have the responsibility, practice, and experience they should have to fit them for independent command, and when placed in command are either nervous and worried, or, if conceited, are over confident and look upon the duties of the captain as "dead easy" and think they can do things much better than the "old man" did. On the other hand, the captain is not over anxious to have his mates qualify for his duties, thinking that it may make him less secure of the position he holds; the feeling that his mates cannot fill his position is no doubt a comfortable as well as a justifiable one in many cases.

"Many of the officers of our merchant ships are foreigners by birth, for it is very difficult to obtain a sufficient number of competent native-born ones. Similarly, the crew is made up largely of foreigners of various nationalities, competition and avarice compelling the steamship lines to engage the cheapest labor obtainable and sometimes the only available. The crews are not trained as they should be, and their short periods of employment make it almost impossible to satisfactorily train them.

"1. Congress should enact a law authorizing and directing the Secretary of the Navy when assigning a vessel as a training ship for any nautical school to also assign a small permanent crew as is now done when a vessel is assigned for the use of a naval militia. The men and petty officers so detailed to be selected for their special abilities, reliability and sobriety. Such ships as the *Newport* and *Ranger*, which are now being used as schoolships, would each require a crew of only about 35 men. At present the states are put to the expense of furnishing such crews and it is practically impossible to retain for any length of time such crews or to obtain such qualified men as could be furnished by the navy.

"2. The schoolships should be commanded by a naval officer ordered to the duty by the Navy Department and all other officers should be naval officers if practicable. These officers being ordered to the duty by the Navy Department would thus be vested with authority necessary to maintain strict discipline, without which such schools will always be partial failures.

"3. All necessary repairs and alterations to the ships or their boats should be done by the navy.

"4. The state legislatures should enact laws requiring every pupil admitted to the schools to sign shipping articles or agreements to attend the school for a period of one or of two years as he might then elect and to comply with all laws and regulations of the ship or school; the act should also provide a punishment for desertion; pupils should not be allowed, as now, to quit the schools at the request of their parents without the very best of reasons, and often without any other reason than that they have become dissatisfied. All punishments for offenses other than desertion could be inflicted by the commanding officer. All vicious and worthless pupils should be promptly dismissed from the schools.

"5. A board of governors or commissioners, consisting of three members, appointed by the governor of the state, should have complete control of the school and the expenditure of all funds appropriated for its maintenance. One member of such board should be a naval officer and the other two, educated men with nautical knowledge and experience. They should have full powers to fix the qualifications for admission and to determine the course of study to be pursued."

PRESIDENT WILSON ON THE MERCHANT MARINE.—After a call of the National Foreign Trade Convention at the White House the President was quoted as saying: "I am sure that I speak the conviction of all of you when I say that one of our chief needs is to have a merchant marine. Because we have to deliver our goods in other peoples' delivery wagons their goods are delivered first and our goods are delivered incidentally on their route."—*Scientific American.*

EUROPEAN UNITY.—To the Editor of the *Army and Navy Gazette*.—Sir: In your issue of April 25 appeared a very interesting communication from a correspondent on the possibility of bringing about eventually a new sextuple alliance of the great powers. Your correspondent argued that this was quite a possible development, basing his very interesting argument on the identity of the most fundamental economic interests of the six great powers, which obtains to-day, all of which interests are threatened with a common ruin, or almost ruin, by a general European war. In that he is undoubtedly quite correct. Such a necessary basis of community of fundamental interests exists to-day, and did not exist formerly.

May I be permitted to draw attention to another reason not mentioned by your correspondent, namely the Pacific question. If a general European war takes place between the great powers of the triple entente and triple alliance, it will leave Australia and New Zealand absolutely at the mercy of Japan. The racial question, a "white" Australia, a "white" New Zealand, is the chief preoccupation of the Anglo-Saxons in Australasia. If a general European war occurs the result must be that the navies of the triple alliance and triple entente will almost destroy each other. To replace the lost vessels will require a vast expenditure spread over many years. During those years Japan (with China behind her) will be able at any time to impose by force of arms on Australasia, whatever solution of the "racial" question in the Pacific she may choose. We should be quite helpless to prevent her. The "white" Australia policy, therefore, is largely dependent for its ultimate success on the possibility of keeping the peace of Europe by uniting the six great powers once more into a new sextuple alliance, similar to the quintuple alliance of 1818 to 1830, but based now on an identity of economic interest which then did not exist. I maintain, therefore, that every Imperialist should endeavor his best to forward such an understanding to be followed by an alliance of the six great powers. I trust that your readers will ponder this point.

STEWART L. MURRAY.
—*Army and Navy Gazette.*

NAVAL STRENGTH OF MINOR POWERS.—The extent to which the minor powers have, within the last few years, increased their naval strength is a factor in the international naval situation which is often lost sight of, but which few of the great powers can afford to ignore. The modern naval development of the lesser European powers has not as yet proceeded very far, but the amount of work which is in hand, authorized, or provided for in new bills is in the aggregate nothing short of extraordinary. Among the nations referred to, Spain was the first to lead the way, and three small dreadnoughts, displacing 15,460 tons apiece, but carrying the same main armament as the *Invincibles* and the German *Derfflinger*, were laid down in 1909-1912. One of these vessels is now in service, the second was launched just over a year ago, and the third will probably go afloat in the course of the present year; and on May 7 last the Minister of Marine introduced a new bill in the Chamber providing, among other things, for the laying down of a fourth dreadnought when the third is launched, and of a fifth in 1917, each of these ships to cost about £2,800,000. The effect of this activity on other powers has not as yet been very marked. The original report of the Portuguese Naval Commission, appointed by the republican government soon after the dethronement of King Manuel, recommended as the principal item in their program the construction of three 22-knot 22,000-ton battleships armed with 13.5-inch guns; but the tenders which were called for in the summer of 1912 referred only to small craft, of which the largest were two small cruisers of 2500 tons and 20 knots. In view of the concealed but constant friction between the two Iberian nations it is improbable that Portugal will remain content with this modest program in face of the latest Spanish development, and these two nations may yet reproduce the local struggle for naval predominance which already marks

and mars the North Sea, the Ægean and South American waters, and which before long may characterize the Adriatic and the Pacific.—*Naval and Military Record.*

SOUTH AMERICAN NAVIES.—Outside European waters the enthusiasm of the minor powers for the possession of dreadnoughts seems to have been somewhat tempered by financial considerations. Nothing has been heard of the Brazilian *Minas Geraes* and *Sao Paulo* since it was reported a year or so ago that they were practically useless owing to untrained handling. Nevertheless, the disposal of the *Rio de Janeiro* to Turkey was followed at no great interval by the placing of an order in this country for a new vessel, which, according to report, will be armed with 15-inch guns and displace 30,000 tons, so that evidently native experience with the two earlier ships has not exercised a deterrent influence on those responsible for Brazilian expenditure. Concerning the Argentine battleships very little is known. A fact possibly not without significance as an indication of the state of feeling in that country is that although the construction of a third dreadnought was authorized as long ago as September, 1912, the order for it has not yet been placed. The only other South American power at present interested in the dreadnought question is Chili, for whom two battleships armed with ten 14-inch and sixteen 6-inch guns are in hand in this country, besides minor craft. Both are building at Elswick, and the *Almirante Latorre,* launched in November last, is expected to be completed early in 1915 and the *Almirante Cochrane* a few months later. What the dreadnought strength of the minor powers amounts to in the aggregate is shown below, vessels "complete" including those which are running or have run their trials:

	Complete	Launched	Ordered or on stocks	Authorized or Projected
Spain	1	1	1	2
Turkey	—	2	1	—
Greece	—	—	2	1
Holland	—	—	—	3
Brazil	2	—	1	—
Argentine	2	—	—	1
Chili	—	1	1	—
	—	—	—	—
Totals	5	4	6	7

The existence of these ships must always involve a menace to other nations, not only because their very existence might prove to irresponsible governments an incentive to their use, but also because the disposal of one or two to a power in the first rank might easily disturb the equilibrium on which the world's peace depends.—*Naval and Military Record.*

PEACE CONGRESS.—The twenty-first Universal Peace Congress will be held in Vienna, September 15-19 next, it being the twenty-fifth anniversary of the first congress in 1889 and the hundredth since the peace of Vienna rearranged Europe and sent Napoleon to Elba. The congress will meet in the Austrian Parliament building by special favor of the government. An exceptionally full program of festivities, visits and entertainments has been arranged by a Vienna committee and the Austrian Government has authorized large reductions of the railway fares for those attending the congress. The subjects discussed will be "Economic Influence of Armaments on Commerce and Industry"; "The Economic Effects of the Balkan War"; "A Draft Convention for the Reduction of Armaments"; "Education as a Method of Insuring the Peace of the World"; "The International Tribunal at The Hague"; "An International Navy (Police Force)"; "The Problem of Franco-German Relations"; "The Participation of Parliaments in

Foreign Policy"; and "The Relations Between Home and Foreign Policy." The elections which have just closed in France were distinguished by a campaign by the peace people, represented by seven nation-wide organizations. These societies did not favor the candidates of any of the many parties, but made the basis of their choice the attitude of the candidate in respect to international policy and membership in the Interparliamentary Union. The appeal made to the voters by the peace societies was sent through the mail to electors, in many cases posted on the bulletins reserved for the advertising matter of candidates or displayed by the societies themselves.—*Army and Navy Journal.*

SICKNESS AT VERA CRUZ.—Speaking of the reports of dysentery and malaria at Vera Cruz the *New York Medical Journal* of June 12 says: "Pending so fortunate an issue as the prompt return of our fleet and army, prophylactic measures are in order. Among those which may be mentioned is one which, though seldom if at all mentioned in English or American literature, has nevertheless been found of great value by French army surgeons in tropical countries for the prevention of inflammatory intestinal disorders, diarrhea and bacilliary dysentery in particular. This consists in the constant use of a flannel binder around the abdomen. Though it is somewhat annoying at first the men soon get used to it. Modern researches have afforded a clue to the manner in which the flannel binder—six inches in width—produces its remarkable effects. Bier's hyperemia, as is well known, proves beneficial by causing vascular dilatation, entailing in turn an increase of bactericidal and antitoxic activity. Now the application of hot air to the abdomen has been found to produce the same effect experimentally, both the skin and deep abdominal viscera having been found to be the seat of a pronounced hyperemia. The flannel bandage, therefore, by promoting and sustaining a corresponding condition in the abdominal viscera, raises their bactericidal and antitoxic activity considerably above normal limits and thus prevents the development of pathogenic organisms to which various intestinal disorders are due." The French Government is reported to have purchased 15,000 of these bandages for its troops in Algiers and made their use compulsory.—*Army and Navy Journal.*

RED CROSS NURSES.—The other day the Red Cross sent by torpedo-boat to Vera Cruz five hundred vaccine points, ten thousand quinine tablets, ten thousand cholera mixture tablets, and other medicines. On the battleship *Wyoming* went a large consignment of condensed milk, malted milk, biscuits in paper cartons, canned corn, and canned beans.

Thus the Mexican situation calls attention to our preparedness for possible war, not only as regards the army and navy, but also as regards hospital and supply forces.

It is not generally realized, for instance, that no less than five thousand nurses are already enrolled for service with our army in case of war with Mexico. The Red Cross is fairly flooded with applications from women all over the country who are anxious to be war nurses; however much their patriotism may be admired, most of them are untrained in technical work, and hence are useless to the Red Cross. The five thousand already engaged are all trained nurses.

In case large numbers of nurses are required in Mexico it is probable that they would be sent in parties, the head nurse to be an army nurse, and the rest Red Cross nurses. The surgeon general of either service may ask the Red Cross to maintain the entire personnel of some reserve hospital by means of one of the Red Cross hospital units, in which case an army or navy surgeon would be placed at the head of the hospital, and the Red Cross personnel act under his direction. The government would probably pay so much per day for each soldier in such a hospital; but this would only be for the living expenses and not for the salaries of the personnel, which the Red Cross would provide.

In case of war the Red Cross field unit will supplement the hospital corps companies and be placed under the direction of army surgeons, and the Red Cross Supply Bureau at the Washington headquarters, with its various local depots or warehouses throughout the country, will be able to fill such requisitions as the army and navy surgeons may make for supplies to mitigate suffering.—*The Outlook.*

THE BOY SCOUTS AFTER FOUR YEARS.—The boy scout movement has enlisted more than three hundred thousand boys in the four years since it was launched in this country. Every one of these boys has been interested at "the dangerous age" of adolescence and has been drawn out of doors and into the most wholesome kinds of upbuilding recreation. They become practically "gangs," but gangs under the direction of grown men who utilize the boy's instinct for adventure to turn their energy into useful or instructive paths. They learn to be trustworthy, loyal, helpful, friendly, courteous, kind, obedient, cheerful, thrifty, brave, clean, and reverent—for these are the twelve statutes of the scout law.

The boys take to it because it is all good fun. They learn to do themselves the things they have read about and admired in story books—to cook a piece of meat and a couple of potatoes in the open without ordinary utensils, to swim at least fifty yards, to know the points of the compass and how to find their way in the woods by the moss on the trees, how to resuscitate a drowning man, what to do for a snakebite, and dozens of other things useful or interesting. Because they do these things in companies, they learn to be square with their companions and to do team-work. And, at home or away from it, they must "do one good turn a day."

Here are some of the good turns they did last year: Five hundred and forty-eight boy scouts from nearby cities helped the veterans at the reunion at Gettysburg—acting as guides, erecting tents, running errands, and helping to care for the sick; boy scouts helped to carry household goods of flood sufferers in Ohio to high ground, and in many cities they collected funds for the relief of victims of the floods; scouts have helped in "clean up" campaigns in Harrisburg, Pa., Buffalo and Yonkers, N. Y., Richmond, Va., and other cities; they have aided in exterminating flies and mosquitoes in many communities; they made it possible for seventy blind people to hear Admiral Peary lecture in New York by escorting them to and from the Museum of Natural History. In many other ways they have shown the spirit of helpfulness that their organization teaches.

Altogether, the scout movement is one of the most intelligent and beneficent agencies for directing the development of young boys that has ever been tried. Practically every city in the United States of more than four thousand inhabitants now has an organization of scouts, and the prospect of further growth, in numbers and influence, is cheering.—*World's Work.*

THE BALKAN ATROCITIES.—The report of the international commission sent into the Balkan peninsula in 1913 on behalf of the Carnegie Peace Foundation to investigate conditions in Macedonia following the war and charge of atrocities made by all sides in that conflight was made public May 18, 1914. It consists of some 200 book pages with maps and photographs, while in the appendices is given the testimony in extenso of the witnesses examined by the commission and from which the most important excerpts bearing on the text have been taken.

The average American knows little of the true conditions in the Near East, and the report of the commission will serve as a history of the Balkan War, its causes and results, as authentic perhaps as any that could be written.

The effect of this document on world peace, the argument which the commission endeavors to drive home in its summing up, is likely discounted by the commission's own admission that conditions in the Balkans to-day are the same if not worse than before the war and its expression of fear that, due to the injustice of the treaty of Bucharest, the stability of the forced peace in the peninsula will not long be maintained.

One of the most important parts of the report is the scathing arraignment of the Greeks for their conduct in the second war, when, allied with the Servians, they drove the Bulgars out of western Macedonia. Atrocities, it was found, were committed on all sides to a greater or lesser extent, the Bulgarians in this matter having the cleanest record. The accusations against the Greeks, on the other hand, are presented so strongly as to discount denial, as the commission presents unmistakable proofs with all its charges.

Another important point is the commission's finding that "there is no clause in international law applicable to land war and to the treatment of the wounded which was not violated to a greater or less extent by all the belligerents."

But the worst charge against the Greeks is their own confession of atrocities contained in letters captured by the Bulgarians on the eve of the armistice. The mail bags of the Nineteenth Greek Infantry regiment were taken at Dobrinichte and after being transported to Sofia were translated. The commission is satisfied they are genuine. Of them the commission says:

"The letters require no commentary. Some of the writers boast of the cruelties practised by the Greek Army. Others deplore them. The statements of fact are simple, brutal, and direct and always to the same effect. These few extracts, each from a separate letter, may suffice to convey their general tenor:

"'By order of the King we are setting fire to all the Bulgarian villages, because the Bulgarians burned the beautiful town of Serres, Nigrita and several Greek villages. We have shown ourselves far more cruel than the Bulgarians. We have violated all the young girls whom we met. . . . .

"'Here we are burning the villages and killing the Bulgarians, both women and children. . . . .

"'We took only a few [prisoners] and these we killed, for such are the orders we have received.

"'We have to burn the villages—such is the order—slaughter the young people and spare only the old people and the children. . . . .

"'What is done to the Bulgarians is indescribable, also to the Bulgarian peasants. It was a butchery. There is not a Bulgarian town or village but is burned.

"'We massacre all the Bulgarians who fall into our hands and burn the villages.

"'Of the 12,000 prisoners we took at Nigrita, only forty-one remain in the prisons and everywhere we have been we have not left a single root of this race.

"'We picked out their eyes [five Bulgarian prisoners] while they were still alive.

"'The Greek Army sets fire to all the villages where there are Bulgarians and massacres all it meets. . . . . God knows where this will end.'"

The Commission's Conclusion.—The commission concludes as follows:

"To what extent have Greece, Servia and Bulgaria shown themselves competent to administer their new domains? What are the guarantees of their future growth in good government and the arts of civilized life? Each nation is working out its destiny under a constitutional government in which the people are duly represented. Undoubtedly the most promising safeguards and the most important means of progress are found in the systems of education which the several nations have established. Greece has been able to extend and broaden her system and to connect it somewhat with the economic interests of the people. Servia also has made worthy attempts along this line, but as one friend of the nation expressed it, 'Education in Servia is strong at the top and weak at the bottom.' Bulgaria in her thirty-four years of independence has made rapid progress in organizing an efficient school system and the percentage of illiteracy has been greatly reduced.

"If the treaty of Bucharest had been in accord with fair play and justice or if the question of boundaries could have been referred to mediation there would have been stronger hopes that the interrelation of the Balkan nations could be improved and strengthened. Under present conditions, however, the case seems well nigh hopeless. What then is the duty of the civilized world in the Balkans, especially of those nations who by their location and history are free from international entanglements? It is clear in the first place that they should cease to exploit these nations for gain. They should encourage them to make arbitration treaties and insist on their keeping them. They should set a good example by seeking a judicial settlement of all international disputes. The consequences of the recent war, economic, moral and social, are dreadful enough to justify any honest effort by any person or by any nation to alleviate the really distressing situation."—*New York Sun.*

NEW TURKO-BULGARIAN TREATY.—The *Kölnische Zeitung* publishes a telegram from Cettigné stating that the terms of the new Turco-Bulgarian treaty are as follows: (1) The formation of a new and more independent Macedonia, extending as far as Veles, which town is to remain Servian; (2) Dadeagatch to be ceded to Turkey; (3) Cavalla is to belong to Bulgaria; (4) Servia to obtain a port in the Gulf of Orfano; (5) Albania to be ruled by a Mohammedan prince; (6) the town of Scutari and the river Boyana to be internationalized.

SERVIAN LOSSES.—The total amount of the Servian losses in the last two wars, says the *Militär Wochenblatt,* amounted, according to the latest information, to 80,000, in round numbers. In the first war about 6000 of these were killed in action, 1000 died of wounds and 7000 of sickness; and in addition 18,000 men became unfit for service owing to wounds received. In the second war 7500 men fell on the battlefield, 1500 died from wounds received, and 9000 from sickness (4000 from cholera), whilst the number of men who became unfit for service from wounds amounted to 30,000.

GERMAN ARMY RESERVISTS.—According to the *Militär Wochenblatt* the number of German Army reservists to be called out in 1914 in the principal branches of the service amount to 416,960 men, thus distributed:

Infantry	300,000
Machine-gun companies	4,800
Jaeger battalions	10,000
Machine-gun sections	1,300
Field artillery	55,860
Foot artillery	28,000
Pioneers	17,000
Total	416,960 men.

CAPTURE AT SEA IN WAR TIME.—The near approach of the Third Hague Conference brings the subject of international arbitration again into prominence, and a resolution put forward in Parliament on the 6th of this month, although it was unfortunately "talked out," gave rise to an important and interesting debate. The mover of the resolution sought to establish that it would be a desirable thing if the government would negotiate with other maritime powers with a view to obtaining such a revision of the laws of naval warfare as would secure immunity to all private property, except in the case of ships carrying materials for war, or attempting to violate a blockade. What differentiates this proposal from that which was considered by the House on a previous occasion, is that it eliminates the question of the right of blockade, which is generally held to be so bound up with the question of immunity of private property that the two points

could not well be dealt with apart. Hence, the deadlock, the government refusing to commit themselves to the consideration or the acceptance of the abolition of the right of blockade, though not disposed to be uncompromising on the subject of the right of capture. Leaving governments out of the question for the moment, the two chief protagonists in the discussion are, on the one hand, the naval experts, who refuse to recede from their position that the destruction of commerce is a weapon which we cannot afford to surrender, and, on the other, the shipping trade and their supporters in and out of Parliament, who hold that it is absolutely futile as a weapon of offence against a possible enemy. We have here, therefore, all the elements of a fierce controversy in which both sides have a considerable distance to travel before they can arrive at any ground of agreement; but, happily, it is not a party question, so there is some hope of it being approached in a calm and dispassionate spirit. The spirit of compromise has already found expression in the national indemnity proposal, the principle of which the government admitted at the last Hague Conference, and the right of shipowners to compensation for losses incurred under the present rules of capture has been proclaimed at many meetings. But we are not in love with these indemnity proposals; they are all more or less open to objection. Under that plan there appears to be nothing to prevent any shipowner from recouping himself for his losses by higher freights, in which case the country would pay twice over for the same loss.

So far, we have mentioned only the government, the naval experts, and the shipowners. But these last two classes are not the only ones interested, nor does it seem right that the question should be discussed as if they alone were concerned. A point of some importance arises out of the answer to the questions, "When two countries are at war, who are the antagonists? Is it only the governments and their armed forces that are at strife, and are not the nations themselves also involved?" There can be little doubt that the former position is untenable. The nation cannot stand apart and look on unconcerned, and a decision on a matter so deeply affecting an island nation should neither be settled finally and absolutely according to the opinions of the naval experts, nor according to those of the shipowners. The government are, therefore, well advised, while maintaining the right of capture, to direct the attention of the country, not so much to the advantages which are, from the naval point of view, supposed to attach to its retention, or to search for arguments for opposing it in the interests of the shipowners, but to an examination of the other conditions with which the question is inextricably bound up, such as blockade, contraband, and the arming of merchant ships, and to get these very contentious matters settled before deciding one way or the other.

There is also the question of the force or efficacy of any agreements which might be drawn up which were without material sanctions to enforce them. Sir Edward Grey, in the course of the debate, drew attention to the danger of loosely drawn agreements, and threw doubt on the suggestion that absolute immunity could be secured, giving illustrations to show that, unless the greatest care were taken in drawing such agreements and in their subscription by us, we might find, if we were unfortunately engaged in war, that we had not secured immunity thereby, and a most dangerous and unsatisfactory position would be created. The illustrations he adduced had reference to wireless telegraphy on merchant ships, and the unsettled state of the rules as regards contraband, which would make evasions of the agreement easy, and certain to be practised in war. We would also suggest that, even if Britain subscribed to such an agreement drawn up in the most skilful and comprehensive manner, it is hard to believe, considering our continual dependence on sea-borne supplies, that an enemy with a powerful navy would be hindered from attacking us when we are so vulnerable, and cutting off our supplies as an ordinary operation of war. It is true that if such an agreement existed, there would have to be a settlement of accounts afterwards, but that prospect would not deter an enemy from attempting to

score an immediate success in war, and chancing the consequences to follow. We admit that strong arguments can be brought forward in favor of the abolition of the right of capture, but although it has been claimed that if this alteration in international law can be agreed on it would, in the long run, be in favor of the national interests, such a claim has not yet been proved, and until it can be substantiated it can only be regarded as the mere expression of a pious hope. It seems to us, after a careful study of the arguments on both sides, that the weight of evidence inclines to the side of the retention of this right; and, that being the case, the wise course would appear to be to "let well alone."—*United Service Gazette.*

CURRENT NAVAL AND PROFESSIONAL PAPERS

NOTE.—Lack of space limits the scope of these references. Upon application, members of the Institute, who wish to investigate further, any naval or military topic, will be supplied with fuller references to current periodicals published in both the United States and foreign countries.

UNITED STATES

THE AMERICAN JOURNAL OF INTERNATIONAL LAW (a quarterly). **April.**—The American Philosophy of Government and its Effect on International Relations, by *A. H. Snow.* The Central American Question from a European Point of View, by *Germanicus.* The Law of Hostile Military Expeditions as Applied by the U. S., by *R. E. Curtis.* Aerial-Land and Aerial-Maritime Warfare, by *W. E. Ellis.* The Declaration of London of Feb. 26, 1909, by *J. B. Scott.* Editorial comment on: Mr. Bryan and the 3d Hague Peace Conference; Arbitration and Peace Treaties; The Academy of International Law at The Hague.

NORTH AMERICAN REVIEW. **June.**—The Real Monroe Doctrine, by *Elihu Root.* International Settlements, by *Brig. Gen. W. Crozier, U. S. A.* Monroe Doctrine Fundamentals, by *Prof. T. S. Woolsey.* **July.**—The Real Mexican Problem, by *R. G. Usher.*

THE AMERICAN REVIEW OF REVIEWS. **June.**—The Taking of Vera Cruz and What Followed. Our Remarkable Canal Treaty with Colombia. Supremacy in the Panama Canal, by *D. J. Hill.* Santo Domingo: Our Unruly Ward, by *T. L. Stoddard.* **July.**—Mediation at Niagara Falls.

SCIENTIFIC AMERICAN. **May 30.**—Propelling Machinery for the Collier *Neptune.* Light Houses for the Aerial Navigator, by *Dr. A. Gradenwitz.* This Year's Additions to Our Navy, by *L. B. Ward.* **June 6.**—The Development of the Aeroplane, by *Dr. R. T. Glazebrook, F. R. S., F. Ae. S.,* Novelties in Aeroplane Design (A Sixty-Mile-an-Hour Gun Carrying Biplane of Steel and a Flying Machine Which is a Mechanical Equivalent of a Soaring Bird). **June 27.**—How Inventors Propose to Save Men from Sunken Submarines (Detachable Buoyant Conning-Towers and Their Uses), by *Major H. Bannerman-Phillips.* The Wanamaker Transatlantic Flier. **July 4.**—An Underwater Siren to Prevent Collisions at Sea, by *P. H. Middleton.* The Future of the Submarine.

JOURNAL OF THE MILITARY SERVICE INSTITUTION OF THE UNITED STATES. **July-August.**—The Attainment of Military Discipline, by *Lt. A. W. Lane* (Silver Medal Prize Essay). Field Orders, by *Major H. A. Smith.* The Panama Canal as a Military Asset, translated from the *Vierteljahrshafte Für Truppenführung und Heereskunde,* Heft 3, 1913.

JOURNAL OF THE UNITED STATES ARTILLERY. **May-June.**—A War Condition Period and How it Can Best be Utilized (Second Prize Essay), by *1st Lt. F. S. Clark.* Seacoast Gun Carriages, by *Major L. T. Hillman.* The New Cooke-Pollen Range-Finder, by *E. W. Taylor.* Comparison of

Simulated Contact and Observation Firing for Mine Practice, by *Capt. C. R. Alley.* Conversion Table. Minutes and Seconds of Arc to Thousandths of a Degree, and Vice Versa, by *L. J. Schroeder.* Coast Defense in the Civil War. Operations in Mobile Bay, by *1st Lt. W. J. Buttgenbach.*

INFANTRY JOURNAL (U. S.). **July-August.**—Monroe Doctrine of the 20th Century, by *Prof. A. B. Hart.* Stratagem, by *Col. C. G. Morton.* Military Schools and the Nation, by *1st Lt. G. R. Guild.* Patriotism, by *Capt. F. P. Tebbetts, O. N. G.* Recruiting (Army), by *1st Lt. R. H. Kelly.* The Organization of the German Army, by *Major C. Miller.* The Service of Information, by *Capt. J. Raoult de Rudeval (French Infantry)*, translated by *1st Lt. B. F. Castle.*

ARMY AND NAVY JOURNAL. **July 4.**—Sinking of Mexican Rebel Gunboat.

JOURNAL OF THE U. S. CAVALRY ASSOCIATION. **May.**—The Battle of Nuevo Laredo, by *1st Lt. B. P. Disque.*

MARINE REVIEW. A Business Man's View of a Ten Weeks' Cruise with the Battleship Fleet, by *Lt. S. W. Utley, Mich. Naval Militia and Vice-President and Manager of the Detroit Steel Casing Co.*

SHIPPING (Illustrated). **June 20.**—U. S. Submarine Tender *Fulton.*

THE MARINE ENGINEER AND NAVAL ARCHITECT. **May.**—Submarine Signaling. Italian Scout-Cruisers *Marsala* and *Quarto.*

JOURNAL OF THE AMERICAN SOCIETY OF NAVAL ENGINEERS. **June.**—Operation and Trials of the U. S. Fleet Collier *Jupiter*, by *Lt. S. M. Robinson, U. S. N.* Destroyer Operating Under One Propeller and Removal of Propeller Without Docking, *compiled from Reports.* Economical Performance of Various Recent Naval Vessels. Designing a Foundry for a Navy Yard, by *Lt. F. M. Perkins, U. S. N.* The Breguet Ejectair, by *M. M. Delaporte, Manager of the Paris Breguet Workshops.* The Cummings Engine-Log System. Oil Burning, by *Lt. Comdr. John J. Hyland, U. S. N.* Methods of Securing Economy in Steam Consumption.—Superheating and Improved Condensing Apparatus, by *Lt. Comdr. H. C. Dinger, U. S. N.* Emergency Repair to Submarines, by *Lt.* (J. G.) *C. N. Hinkamp.* The Desirability of Using High Mean Referred Pressures; discussion by *Lt. Comdr. H. C. Dinger, U. S. N.* Advanced Engineering Education. Address of *Prof. Chas. Lüeke*, at the banquet A. S. N. E., April 25, 1914. Description and Trials of Torpedo-Boat Destroyer *Duncan*, by *A. Conti.* The Effect of Mixing Oils in Forced-Lubrication Systems, by *Lt. G. S. Bryan, U. S. N.* Gearing and the Electric Drive, by *Lt. Comdr. H. C. Dinger, U. S. N.* Torpedo-Boat Destroyers *Bisson* and *Renaudin*, by *E. N. Janson.*

INTERNATIONAL MARINE ENGINEERING. **May.**—Convention for the Safety of Life at Sea (abstract of the text and regulations). Electric Towing Locomotives for Panama Canal Locks. **July.**—The Rational Non-Diesel Marine Oil Engine, by *A. H. Ziegler.* The Submarine Tender *Fulton* (Diesel Engines).

JOURNAL OF THE FRANKLIN INSTITUTE. **June.**—The Present Status of Airships in Europe, by *Asst. Naval Constructor J. C. Hunsaker, U. S. N.*

NATIONAL GEOGRAPHIA MAGAZINE. The Probable Effect of the Panama Canal on the Commercial Geography of the World, by *O. P. Austin* (Vol. 25, 1914).

ENGLAND

THE CONTEMPORARY REVIEW. **June.**—Foreign Affairs (Schemes for a New Balance of Power), by *Dr. E. J. Dillon.*

THE NINETEENTH CENTURY AND AFTER. **June.**—An Ideal Alliance (Germany, England, and America Shoulder to Shoulder), by *Sir Bampfylele Fulton, K. C. S. Q.* The Army of the United States, by *Sir Henry Blake,*

G.C.M.G. A New German Empire; the Story of the Bagdad Railway (concluded), by *A. Geraud.* **May.**—Mexico from Within: an English Resident's View, by *A. Curphey.* America's Foreign Policy and the Mexican Embroglio, by *J. E. Barker.*

THE FORTNIGHTLY REVIEW. **May.**—Japan and the United States, by *J. D. Whelpley.* A Broken Treaty: The Panama Canal Tolls, by *J. M. Kennedy.*

UNITED SERVICE MAGAZINE. **May.**—The Navy and Wellington's Army, by *Comdr. H. N. Shore, R.G.* The Balkan War, by *Capt. H. T. Russell, R.A.* Progress in Aeronautics, by *Major H. Bannerman-Phillips.* **June.**—The Strategy of Oceania, by *T. M. Maguire, LL.D., F.K.H.S.* National Unity, by *A Canadian.* A Study in Defensive War, by *Major G. W. Redway.* Progress in Aeronautics, by *Major H. Bannerman-Phillips.* **July.**—Discipline in the Navy and the Ulster "Pogrom," by *"Admiral."* Naval Pressure on Ulster, a letter of *Commander The Lord Ellenborough, R.N.* National Unity, by *A Canadian.* The Shadow of the Sword, by *Captain A. F. U. Green, R.A.* The Influence of Conscription in Japan, by *James Weymouth.* Progress in Aeronautics, by *Major H. Bannerman-Phillips.*

JOURNAL OF THE ROYAL UNITED SERVICE INSTITUTION. **May.**—The Status Under The Hague Conference of Civilians Who Take up Arms During the Time of War, by *Gilbert Mellor, Esq., Deputy Judge-Advocate.* The Royal Naval Volunteer Reserve, by *Commander the Marquis of Graham, C.V.O., C.B., R.N.V.R.* The United States *versus* Mexico, by *T. Miller Maguire, LL.D.* An account of the Stranding and Re-floating of the *San Giorgio,* translated by *Lt. P. Kekewich, R.N.,* from the *Rivista Nautica.* The Year 1913 in Foreign Armies: Germany. The Russian Army in a Future War, translated by *Lt. B. M. B. Bateman, R.A.,* from the *Revue des Francais.* The Call for Higher Efficiency in Musketry, by *Major G. S. Tweedie.* Subtlety in Nature and War, by *Fleet-Surgeon C. Marsh Beadnell, R.N.* **June.**—The Defense of Localities Against Aerial Attack, by *Lt. Col. L. Jackson, C.M.G.* The United States *versus* Mexico, by *T. M. Maguire, LL.D.* Sea Power and Naval Strength, by *Vice-Admiral Freiherr von Waltzahn* translated from *Deutschland unter Kaiser Wilhelm II.*

THE JOURNAL OF THE ROYAL ARTILLERY. **May.**—Aircraft in War, by *Col. H. S. Massy, C.B., F.R.G.S.* A Word for Large Calibers, by *Don Luis Solano,* translated by *Major Gen. J. C. Dalton.* **June.**—The Panama Canal and the West Indies, by *Capt. F. E. Whitton.* **July.**—The Aero Show at Olympia, 1914, by *Brig. Gen. F. G. Stone.*

ARMY AND NAVY GAZETTE. **June 20.**—Mediterranean Questions.

PAGE'S ENGINEERING WEEKLY. **June 5.**—Present Status of the Large Gas Engine, by *Prof. P. Langer.*

ENGINEERING. **June 12.**—The Future of the Submarine Boat. **June 5.**—The Development of the Aeroplane, by *Dr. R. T. Glazebrook, F.R.S.* **May 1.**—New Works at Portsmouth Dock Yards (new 32,000 ton floating dock). The Development of High Power Marine Diesel Engines.

THE ENGINEER. **June 12.**—High Power Diesel Engines (editorial comment in same issue), by *J. Richardson, B.Sc.* **June 5.**—Seaplane Submarine and Ship. The French Destroyers *Bisson* and *Renaudin* (detail description with drawings).

FRANCE

LE YACHT. **June 27.**—Le personnel des services centraux du ministère, by *P. Claude.* **June 20.**—Les convoyeurs d'escadrilles, by *Henri Bernay.* **June 13.**—Les manœuvres navales de 1914 (suite), by *P. Le Roll.* **June 6.**—Les manœuvres navales de 1914: Deuxième thème. **May 30.**—Les

manœuvres navales de 1914: Exécution du premier thème. **May 23.**—La nouvelle organisation de l'armée navale, by *Henri Bernay*. **May 16.**—Mines sous-marines et mouilleurs de mines, by *P. Le Roll*. **May 9.**—L'utilisation de la torpille, by *Henri Bernay*.

LA VIE MARITIME. **June 25.**—Dans la Méditerranée, by *Charles Bos*. Tubes aériens ou sous-marins, by *Jean Clerc*. **June 10.**—Les grandes Manœuvres, by *Charles Bos*. Compte-rendu des grandes Manœuvres. **May 25.**—A l'Armée Navale, by *Charles Bos*. Pour la maîtrise de la Méditerranée, by *Jean Clerc*. **May 10.**—Le besoin de se défendre sur mer, by *Un Capitaine de Frégate*. Les attachés navals et les emprunts étrangers. Le cinquantenaire de la torpille automobile, by *Un Officier en Retraite*.

GERMANY

MARINE-RUNDSCHAU. **June.**—Die englischen Kolonialmarinen, von *Kapt.-leut. v. Blanquet* (Schluss). Hilfeleistung S. M. S. *Dresden* während der mexikanischen Unruhen.

UEBERALL. **May.**—Oesterr. Marinepolitik, von *Emo Volkert*. Der strategische Wert der österr.-ungar. Küste, von *Emil Descovich, nautischer Oberkommissar im Handelsminist. u. Linienschiffslt i. d. R.* Oesterreichs Seemacht in der Geschichte, von *E. Volkert*. Kriegshafen und Flottenstützpunkte Oesterr.-Ungarns, von *k. u. k. Korvettenkapitän Artur Lengnick*. Das Schulwesen in der österr.-ungar. Kriegsmarine, von *E. Ligersee*. Das Schiffsmaterial der österr.-ungar. Marine, von *Emo Volkert*. Die Organisation der k. u. k. Kriegsmarine, von *I. Rottenberg*. Die österr.-ungar. Handelsmarine. Der österreichische Flottenverein, von *Nicolaus Graf Desfours-Walderode, Vizepräsident des österr, Flottenvereins*. Oesterr. und ungar. Erfindungen auf maritimem Gebiet, von *E. Descovich, Naut. Ober-Kom. und Linienschiffslt. i. d. R.* **June.**—Seestrategische Grundlagen, von *Konteradmiral z. D. Stiegl*. Die Organization des Unterseebootsdienstes in der russichen Marine, von *Kapt. N. N.* **July.**—England und die nordamerikanische Union, von *Paul Delin*. Die Verwendung von Minen im Seekriege, von *Cand. jur E. N. Schlieper*.

AUSTRIA

MITTEILUNGEN AUS DEM GEBIETE DES SEEWESENS. **May.**—Zur Geschichte der Donauflottille. Admiralstabskurs. Der Torpedo und seine Verwendung im Kriege. Das taktische Peilungsdiagramm.

ITALY

REVISTA MARITTIMA. **April-May.**—Il concentramento del fuoco e l'armamento secondario, by *Romeo Bernotti, Capitano di corvetta*. Il conflitto fra il Messico e gli Stati Uniti d'America, by *Illyricus*. Il traguardo del capofila nella contromarcia, by *Giuseppe De Luigi, Tenente di vascello*.

NAVAL PUBLICATIONS

BOOK REVIEW

"The War with Mexico, 1846-1848." A select bibliography on the causes, conduct, and the political aspect of the war, together with a select list of books and other printed material on the resources, economic conditions, politics and government of the Republic of Mexico, and the characteristics of the Mexican people. With annotations and an index. By Henry E. Haferkorn, 4 pls., 93 + XXVIII pp. Paper, 50 cents; bound, $1.00. (Published by "Professional Memoirs," Washington Barracks, D. C.)

It is believed that practically every American military man, interested in Mexico, and that includes all officers of the army, navy and militia, has felt, in his studies concerning that country, the lack of a systematic guide to the literature of our mutual relations, military and economic. This has resulted in depriving the individual of convenient access to much material that he would use if he knew of its existence and its comparative value. To such an extent is this the case that the wonder is often expressed among the military, that so little material of value exists from which to draw lessons from the work of our predecessors, which may enable us to profit by their experiences in that future which is inevitably more and more closely the destinies of the two nations.

The book appears at a time that is particularly appropriate. In the light of present events there is a greatly increased demand in America for knowledge of Mexico, its history, its people, its military strength and its genius. The awakening is much needed because as a people we are full of misconceptions concerning Mexico.

The book gives to the reader at the outset the judgment of several scholarly historians, whose time has been devoted to Mexican literature, as to the comparative worth of the available material. The student is thus enabled to direct his energies along the most approved channels, thus deriving the best results from the time he can give to the study instead of frittering away his time on works of little or no value.

The classification adopted by the author is simple and systematic. First in order is material on the general history of Mexico, then follows general material on the war of 1846-48. Next come special intensive campaign studies, followed by the collection of biographical works. The operations of the American Navy and its relations to the army complete the war material. Although not indicated by the title, the book contains a list of valuable material on modern Mexico, economic, political, etc., and concludes with a specially valuable list of means of communication: Railroads, roads and trails, canals, inland waterways, rivers, seaports, posts

and telegraphs, public works, etc. Although the majority of the titles are naturally American the list includes many works of Mexican and European origin. The military man will note the absence of a reference to Upron's "Military Policy of the U. S.," a volume which gives an economic, legislative and military summary of the war; its cost, policy, lessons to be drawn, etc.; not elsewhere obtainable.

The book will have a special value to officers of the army, navy and militia; to investors, travelers, readers of travel, and students of history. Whoever, for any reason, is interested in Mexico, will save time and energy by using this book to direct his studies.

The book has evidently been prepared with great labor and care. The author has given to the task the best efforts of a logical and scholarly mind, and the result of his labors is a splendid example of scientific bibliographical research.

MAJORS P. S. BOND and M. J. MCDONOUGH,
Corps of Engineers, U.S.A.

BOOKS RECEIVED

The following books are now in the hands of reviewers:

"The Gyroscope," by Dr. F. J. B. Cardeiro.

"German Sea Power," by Mr. Archibald Hurd and Mr. Castle.

"George Hamilton Perkins, U. S. N.," by C. S. Alden, Ph. D.

"Les Derniers Jours du Sebastopol," à Port Arthur par Le Commandant de Balincourt.

"Our Manysided Navy," by Robt. W. Neeser.

NAVAL ACADEMY GRADUATES' ASSOCIATION

The twenty-ninth annual business meeting of the Association was held in the Officers' Mess Building on June 4, Rear Admiral O. F. Stanton, date '49, presiding. The following were elected members of the Council: Colonel R. M. Thompson, '68; Captain W. H. G. Bullard, '86; Captain G. H. Burrage, '87; Commander L. H. Chandler, '88; Commander W. W. Phelps, '89; Commander J. F. Hines, '92; and Professor D. M. Garrison, '95, member and secretary-treasurer.

The change in Art. I of the Constitution was adopted, and having been carried at two successive meetings, it now becomes effective. Art. I will therefore read:

ART. I, SEC. 1. The United States Naval Academy Graduates' Association is established for the purpose of promoting kindly feeling and social intercourse among its members, of fostering the memories of the Naval Academy, and of preserving the records of all the graduates.

SEC. 2. It shall be a fixed purpose of the Association to uphold the moral tone, the intellectual standards, the traditions and the esprit of the Naval Academy and of the United States Navy, and to exert its influence to prevent the decline of the high ideals of the academy and its graduates.

The report of the Farragut Memorial Window Committee was given by its secretary, Commander Jewell, and on motion the report was received and filed. As the report sets forth very clearly the progress so far made by the committee, together with the obstacles which have been overcome, it is felt that the complete report will prove of interest to all graduates. The report follows:

To the President, Council, and Members, Naval Academy Graduates' Association.

GENTLEMEN: By direction and in behalf of the committee appointed to "determine upon the design, cost, and method of financing the Farragut memorial window, and to carry the matter to completion," I have the honor to submit the following report of the work of that committee for the year ending with this meeting.

The committee met on December 2, 1913, and organized by the election of Rear Admiral J. C. Watson, U. S. N., as chairman, and Commander C. T. Jewell, U. S. N., as secretary-treasurer.

Before the first of the new year letters were sent to a number of reliable artists and dealers in stained glass, inviting them to submit designs

for the window, the purpose, position, and commemorative character of which were carefully described. March 15 was ultimately set as the time limit for submitting such drawings. On March 17 the committee considered the seven designs which had at that time been submitted. None of the designs were found to be at all satisfactory, principally because they in no way indicated adequately that they were in memory of Farragut.

The committee then sought the assistance of the National Commission of Fine Arts, of which Mr. Daniel C. French is chairman. The Commission of Fine Arts showed great interest in the project and appointed as a committee of one, to act with and advise our committee, a member of the commission who is one of the foremost mural artists in the country, but who has asked that his name not be announced at present. He kindly accepted and has ever since been giving us the benefit of his genius and experience at a really considerable sacrifice of time.

In the meanwhile, the committee had taken into favorable consideration some suggestions of Admiral Watson, who, because of his intimate knowledge of Admiral Farragut's character and career, was able to bring out certain points which could be well employed in artistic memorial work.

After consultation with our artistic adviser, the committee invited Mr. Frederick Wilson to design and the Gorham Company, of New York, to produce a window based on the suggestions of the committee derived from Admiral Watson's proposals. Mr. Wilson is the designer of all of the windows now in the chapel.

Yesterday (June 3) I received a message from Mr. Wilson stating that the design was finished. In conjunction with our adviser, the committee will scrutinize this design so as to eliminate any technical errors in details. The design having been finally approved, a contract for the erection of the window will be entered into with the Gorham Company, and the work will be started as soon as the superintendent of the Naval Academy thinks proper.

The committee decided not to go before the body of graduates for subscriptions until it had a definite proposition to submit to them. The cost of the design could not be determined until the design had been selected. In fact, at this time, the committee is not actually aware of the cost of the proposed window. But the committee estimates that the finished window, together with the expenses necessary to erect it and to finance the scheme, will amount to $8000. On this basis, the committee has determined to ask every living graduate whose address is known for the sum of $5. Any amount, greater or less, will of course be accepted, providing that it comes from a graduate of the Naval Academy.

The committee has determined to begin the solicitation of contributions by requesting the commandants of navy yards, the commanding officers of ships, the secretaries of auxiliary alumni associations, and other persons in similar positions, to act as agents for the committee in circulating subscription lists among the graduates in their reach. But because the great majority of graduates will not be at their usual addresses during the summer months, and because the treasurer of the committee will also be away at that time, it has been decided to postpone the collection of funds until about October 1, next.

In order to secure the amount needed, the active co-operation of every member of this Association will be required. The committee begs that when the appeal is made, the members of the Association will do their part in giving the matter widest publicity among graduates.

By direction of the committee.

C. T. JEWELL,
Secretary-Treasurer.

NOTE.—Later information sets the cost at between $9000 and $10,000. —ED.

Under the head of new business, the Council submitted a proposed change in Art. III, Sec. 1, of the Constitution. This, as it now stands, reads as follows:

ART. III, SEC. 1. The dismissal from the navy, or the conviction in a court of justice of an infamous offence, of any graduate, shall constitute a sufficient ground for his exclusion from this Association if not a member, and for his expulsion if a member.

The Council feel that there are cases where, for the best interests of the Association, a graduate should be expelled or excluded, and that Art. III, as above set forth, cannot reach.

After amendment the change was passed on its first reading. It is as follows:

ART. III, SEC. 1. The dismissal from the navy of any graduate, or the severance of his connection from any government service by reason of moral disqualifications, or the conviction of a graduate in a court of justice of an infamous offence, shall constitute a sufficient ground for his exclusion from this Association if not a member, and for his expulsion if a member.

The cases of six members of the Association who have been dismissed from the naval service were presented for action. Four were laid on the table. In the following two cases expulsion from the Association was moved and carried.

Grad. No. 2804 } Steele, Benjamin Harrison, Class '05, dismissed Nov.
Ass'n No. 1499 } 11, '13. Lieutenant.
Grad. No. 3137 } Kittel, Ernest George, Class '07, dismissed Dec. 12, '13.
Ass'n No. 1728 } Ensign.

The following resolution was adopted:

WHEREAS, In the rebuilt Naval Academy some ancient designations of roadways and rows have disappeared or have been transferred to new localities; be it

Resolved, That the United States Naval Academy Graduates' Association petition the superintendent to restore to their original localities such of those names of roadways and rows as would continue to designate the localities or approximate localities of the old Naval Academy.

In this connection there was considerable discussion as to the desirability of naming the new buildings after a method similar to that used in naming roads and rows, with the idea of perpetuating the names of officers who have been distinguished in the several branches, for the teaching of which the buildings are occupied.

A vote of thanks was tendered the Board of Control of the Naval Institute for their kindness in establishing this department in their publication. Meeting adjourned.

At the annual dinner, held in the Auditorium, Rear Admiral O. F. Stanton, date '49, presided, Second Lieutenant S. M. Decker, U. S. A., class '12, being the adjutant. One hundred and forty-six were present at the dinner, the classes most largely represented being '84, '06 and '07.

Real Admiral A. Ward, '71, was toastmaster; Chief Constructor W. C. Capps, '84, responded to the toast "The Navy"; Captain W. F. Fullam, '77, "The Naval Academy"; Mr. F. J. Symmes, '68, "Graduates in Civil Life"; Commander C. A. Adams, '68, "Class of '68"; Captain F. K. Hill, '84, "Class '84"; Lieutenant S. M. Decker, U. S. A., '12, "The Flag"; The Toastmaster, "Sweethearts and Wives."

It is not proposed to report the speeches made, or the informal talks given, but the committee in charge of the dinner wishes to publicly thank the several speakers, realizing, as the committee does that to the above-named gentlemen is due no small proportion of the credit for the success of the twenty-ninth annual dinner.

Extracts from the reports of the secretary-treasurer, June 4, 1914:

Total number of graduates to date		4130
Increase since last report		139
Number in Graduates' Association		2335
Increase in membership		93
Members of Association living		1937
Balance on hand June 5, 1913		$223.81
Receipts for year	$1846.00	
Expenditures for year	1572.18	
Increase for year		273.82
Balance on hand June 4, 1914		$497.63

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its forty-first year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The PROCEEDINGS are published every two months and anyone may subscribe for them. The annual subscription is $3.00; single copies, 50 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1915

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1915. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. It is requested that all essays be submitted typewritten and in duplicate, if practicable; essays submitted written in longhand and in single copy will, however, receive equal consideration.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

B. C. ALLEN,
Lieut. Commander, U. S. N., Secretary and Treasurer.

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Mutual Relations of Gunnery and Tactics."

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training; (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

"A Personnel Reserve for the Naval Service."

"Value of Speed as an Offensive Element in Battleship Strategy and Tactics, as Compared with Armor."

LIST OF PRIZE ESSAYS

1879

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut.-Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut.-Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention. 1913. By Lieut.-Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-day. Prize Essay, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. Navy.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. Navy.

THE BATTLE OF LAKE CHAMPLAIN

From the painting by Davidson, owned by the Hon. Smith M. Weed, Plattsburgh. Half-tone furnished by Rodney Macdonough